THE 14th INTERNATIONAL CONFERENCE ON PHOTONICS AND APPLICATIONS (ICPA-14)

THE 14th NATIONAL CONFERENCE ON OPTICS AND SPECTROSCOPY (NCOS-14)

Quy Nhon University,
Quy Nhon Nam Ward, Gia Lai Province, Vietnam
September 30 –October 03, 2026

ABSTRACTS & PROGRAM

https: //iop.vast.vn/icpa/2026/

2026

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THE 14th INTERNATIONAL CONFERENCE ON PHOTONICS AND APPLICATIONS (ICPA-14)

THE 14th NATIONAL CONFERENCE ON OPTICS AND SPECTROSCOPY (NCOS-14)

ORGANIZERS

Institute of Physics (IOP), VAST

Quy Nhon University

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Society of Optics & Spectroscopy, VPS

International Centre of Physics (ICP), IOP, VAST

Institute of Molecular Science in Orsay, Paris-Saclay Uni., French

Institute of Laser Engineering, Osaka University, Japan

Advanced Photonics Research Institute, GIST, R. Korea

B. I. Stepanov Institute of Physics, NAS, Belarus

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Nguyen Dai Hung (VPS, Vietnam)

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Elmer S. Estacio (University of the Philippines Diliman, Philippines)

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THE 14th INTERNATIONAL CONFERENCE ON PHOTONICS AND APPLICATIONS (ICPA-14)

THE 14th NATIONAL CONFERENCE ON OPTICS AND SPECTROSCOPY (NCOS-14)

CONFERENCE TOPICS

Optics and Optical Physics

Photonics and Integrated Photonics

Spectroscopy and Optical Characterization

Advanced Laser Sources and Technologies

Nonlinear Optics and Ultrafast Phenomena

Photonic Materials, Nanostructures and Devices

Optoelectronics and Optical Communications

Applications of Optics, Photonics and Spectroscopy

BRIEF PROGRAM

Note: - *SESSION A:* PHOTONICS AND APPLICATIONS
- *SESSION B*: OPTICS AND SPECTROSCOPY

Date / *Time*	**WEDNESDAY** *30 September 2026*	**THURSDAY** *01 October 2026*	**FRIDAY** *02 October 2026*	**SATURDAY** *03 October 2026*
8:00 - 12:15		- ***Registration*** - ***Official Opening*** - ***PLENARY SESSION***	- ***SESSION A*** - ***SESSION B*** - ***SESSION POSTER II***	***Social Program***
		LUNCH (offered by Conference Organizing Committee)		
13:30 - 17:45	***Registration*** (Quy Nhon Nam Ward, Gia Lai Province, Vietnam)	- ***SESSION A*** - ***SESSION B*** - ***SESSION POSTER I***	- ***SESSION A*** - ***SESSION B*** - ***SESSION POSTER III*** ***(Official Closing)***	***Social Program***
19:00 - 20:00		***Welcome Party offered by the ICPA Organizing Committee***		

PROGRAM

PLENARY SESSION

PROGRAM

October 01, 2026 (Thursday) - Hall B - 1st Floor

07:30 - 08:30 Registration

08:30 - 09:00 Official Opening (Nguyen Thanh Binh & Tran Quoc Tien)

Speech by Representative of the Vietnam Academy of Science and Technology

Speech by M. Huynh Thanh Dat ((President of the Vietnam Optical Society)

Speech by Representative of Quy Nhon University

Speech by M. Nguyen Dai Hung (Conference President)

Speech by M. Nobuhiko Sarukura (Osaka University, Japan)

Speech by M. Yeung Lak Lee (APRI, GIST. R. Korea)

Speech by M. Nguyen Quang Liem (President of The Vietnam Physical Society)

Speech by M. Dinh Van Trung (Institute of Physics, VAST)

09:00-09:15 CONFERENCE PHOTOGRAPH/COFFEE BREAK

PLENARY SESSION

(Hall B - 1st Floor)

Chairperson:

Prof. Nguyen Dai Hung (Vietnam Physical Society)
Prof. Elmer Estacio (University of the Philippines, Philippines)

PL-01
09:15 - 9:45 **TELECOM SINGLE-PHOTON EMITTERS IN SILICON: DETERMINISTIC CREATION AND PHOTONIC ENGINEERING OF QUANTUM LIGHT**

Hai Son Nguyen
CNRS-International-NTU-Thales Research Alliance (CINTRA), IRL 3288, Singapore, Singapore
Univ Lyon, Ecole Centrale de Lyon, INSA Lyon, Université Claude Bernard Lyon 1, CPE Lyon, CNRS, INL, UMR5270, Ecully, France

PL-02
9:45 - 10:15 **HALIDE DEFECT PASSIVATION IN PEROVSKITE NANOCRYSTALS BY THE FRIEDEL–CRAFTS REACTION**

Chang-Lyoul Lee
Advanced Photonics Research Institute (APRI), Gwangju Institute of Science and Technology (GIST), Gwangju 61005, Republic of Korea

PL-03 **DEVELOPMENT OF GaN-BASED VCSELs**

10:15 - 10:45

Baoping Zhang, Yang Mei, Leiying Ying
Southern University of Science and Technology, Shenzhen 518055, China
Xiamen University, Xiamen 361100, China

PL-04
10:45 - 11:15 **LASER CRYSTAL APPLICATION WORK WITH ASEAN RESEARCHERS**

Nobuhiko Sarukura
Institute of Laser Engineering, The University of Osaka, 2-6 Yamadaoka, Suita, 565- 0871, Osaka, Japan
New Industry Creation Hatchery Center, Tohoku University, Sendai 980-8579, Japan

PL-05
11:15 - 11:45 **QUANTUM PHOTONICS FOR SPACE – APPLICATIONS, CHALLENGES AND SOLUTIONS**

Andreas Wicht
Ferdinand-Braun Institut (FBH), Berlin, Germany

PL-06
11:45 - 12:15 **DEVELOPMENT OF ULTRA-HIGH SPATIAL RESOLUTION GLASS SCINTILLATORS FOR X-RAYS IMAGING APPLICATION**

Jakrapong Kaewkhao
Center of Excellence in Glass Technology and Materials Science (CEGM), Nakhon Pathom Rajabhat University, Nakhon Pathom 73000, Thailand

12:15-13:30 **LUNCH (at Hai Au Hotel)**

SESSION A
PHOTONICS AND APPLICATIONS

SESSION A:
PHOTONICS & APPLICATIONS
October 01, 2026 (Thursday) - Hall B - 1st Floor

Chairperson:

Prof. Jakrapong Kaewkhao (Nakhon Pathom Rajabhat University, Thailand)
Prof. Pham Hong Minh (Institute of Physics, VAST)

A-01
13:30 - 13:50 **LIGHT MATTER INTERACTION ENHANCEMENT BY POLYMER BASED RESONANT WAVEGUIDE GRATINGS**
(Invited Talk)

Ngoc Diep Lai
Laboratoire Lumiere, Matiere et Interfaces (Lumin), Umr 9024, Ens Paris-Saclay, 4, Avenue Des Sciences, 91190 Gif-Sur-Yvette, France

A-02
13:50 - 14:10 **FEMTOSECOND LASER IONIZATION MASS SPECTROMETRY FOR THE EVALUATION OF FERMENTED RED-YEAST RICE PRODUCTS**
(Invited Talk)

Tomoko Imasaka, Katsunori Yoshinaga, Cheng-Huang Lin, and Totaro Imasaka
Faculty of Design, Kyushu University,
Kyushu University,
Hikari Giken, Co., Fukuoka, Japan

A-03
14:10 - 14:30 **MULTIFUNCTIONAL EMBEDDED ALUMINUM MESH IN POROUS ANODIC ALUMINA ON GLASS: ULTRALOW-RESISTANCE TRANSPARENT CONDUCTOR WITH TUNABLE MID-INFRARED RESPONSE**
(Invited Talk)

Quang Minh Ngo, Hoang Minh Luong, Gia Kien Ngo, Thanh Son Pham, Huu Tu Nguyen, Thanh Binh Pham, Anh Tu Tran, Thu Trang Hoang, Duc Cuong Nguyen, Dzmitry Sasinovich, Vladislav Dudich, Sergey Zavadski, and Serguei Lazarouk
University of Science and Technology of Hanoi, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Nghia Do, Hanoi, Vietnam
Centre for Integrated Materials, Processes & Structures, Department of Mechanical Engineering, University of Bath, Bath, BA2 7AY, United Kingdom
Faculty of Engineering Physics and Nanotechnology, VNU University of Engineering and Technology, 144 Xuan Thuy Road, Cau Giay, Hanoi, 100000, Vietnam

School of Electrical and Electronic Engineering, Hanoi University of Industry, 298 Cau Dien, Tay Tuu, Hanoi, Vietnam
Viet Duc College of Medicine and Medical Device, Viet Duc University Hospital, 1/89 Luong Dinh Cua, Kim Lien, Hanoi, Vietnam
Institute of Materials Science, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Nghia Do, Hanoi, Vietnam
Belarusian State University of Informatics and Radioelectronics, P. Browka 6, 220013 Minsk, Belarus

A-04
14:30 - 14:45

TERAHERTZ-PUMP AND X-RAY-PROBE SPECTROSCOPY OF FERROELECTRICS
(Invited Talk)

N. Kida
Japan Synchrotron Radiation Research Institute (JASRI)
RIKEN SPring-8 Center

A-05
14:45 - 15:05

GAS PHASE RELAXATION DYNAMICS OF TETRACENE AND PENTACENE
(Invited Talk)

Oriane Shviro, Jonas Fackelmayer, Audrey Scognamiglio, Lou Barreau, Constant Schouder, Ingo Fischer and Lionel Poisson
Université Paris-Saclay, CNRS, Institut des Sciences Moléculaires d'Orsay, 91405, Orsay, France.
Institute of Physical and Theoretical Chemistry, University of Würzburg, Am Hubland, 97074 Würzburg, Germany.

A-06
15:05 - 15:20

FABRICATION OF MICROSTRUCTURES FOR REFRACTIVE-INDEX CONTROL IN ZINC OXIDE USING ULTRASHORT-PULSE LASER MICROMACHINING

Ryosuke Fujii, Haruto Miura, Hiumi Terashima, Verdad C. Agulto, Shiyu Feng, Kosaku Kato, Makoto Nakajima, Ono Shingo
Department of Physical Science and Engineering, Nagoya Institute of Technology, Gokiso-cho, Showa-ku, Nagoya, Aichi 466-8555, Japan
Institute of Laser Engineering, Osaka University, 2-6 Yamadaoka, Suita, Osaka 565-0871, Japan

A-07
15:20 – 15:35

REVIEW OF EXPERIMENTAL OBSERVATIONS OF GROUP INDEX IN A MULTI-LEVEL Rb ATOMIC MEDIUM UNDER ELECTROMAGNETICALLY INDUCED TRANSPARENCY

Ho Hai Quang, Nguyen Huy Bang, Nguyen Van Ai, Phan Van Thuan, Le Canh Trung, Dinh Xuan Khoa, Luong Thi Yen Nga, Do Mai Trang and Le Van Doai
Vinh University, 182 Le Duan Street, Nghe An Province, Vietnam
Nam Dinh University of Technology Education, 172 Phu Nghia Street, Ninh Binh Province, Vietnam
Ha Tinh University, Ha Tinh Province, Vietnam
Department of Education and Training of Nghe An, Nghe An Province, Vietnam

15:35-15:45 COFFEE BREAK

Chairperson:

Prof. Sarukura Nobuhiko (The University of Osaka, Japan)
Prof. Ngo Quang Minh (Univ. of Sci. & Techn. of Hanoi - USTH, VAST)

A-08
15:45 – 16:05 **ULTRAFAST LASER MICROMACHINING OF THROUGH-DRILL HOLE FOR SEMICONDUCTOR APPLICATION**
(Invited Talk)

Joo Jae Young
Korea Photonics Technology Institute

A-09
16:05-16:25 **GROWTH AND RADIATION RESPONSE OF Nd-DOPED Lu_2O_3 CRYSTALS FOR A REMOTE DOSIMETRY SYSTEM IN HIGH-DOSE-RATE ENVIRONMENTS**
(Invited Talk)

Satoshi Ishizawa, Shunsuke Kurosawa, Akihiro Yamaji, Akira Yoshikawa, Takushi Takata, Hiroki Tanaka
IMR, Tohoku University, 2-1-1 Katahira, Aoba-ku, Sendai, Miyagi, Japan
Dept. of Energy Engineering Science, Nagoya University, Nagoya, Aichi, Japan
NICHe, Tohoku University, 6-6-10 Aoba, Sendai, Miyagi, Japan
KURNS, Kyoto University, 2 Asashiro-Nishi, Kumatori, Osaka, Japan

A-10
16:25– 16:45 **TEMPERATURE EFFECTS ON SOLAR PV SYSTEM ENERGY GENERATION**
(Invited Talk)

Arvin Escultero, Carl Michael F. Odulio
EEE Institute, University of the Philippines Diliman, Quezon City

A-11
16:45 - 17:00 **FABRICATION AND CHARACTERIZATION OF AL-DOPED MG_2SN FILMS BY RF MAGNETRON SPUTTERING**

Thi Hai Yen Nguyen, Phuong N. Nguyen, Hoai Phuong Pham, Hai Dang Ngo
Faculty of Science, Dong Nai University, 4 Le Quy Don Street, Tam Hiep Ward, Dong Nai province, Vietnam
Institute of Applied Materials Science, Vietnam Academy of Science and Technology (VAST), 29TL Street, Thanh Loc Ward, District 12, Ho Chi Minh City 7000, Viet Nam
Nguyen Tat Thanh University, Center for Hi-Tech Development, Saigon Hi-Tech Park, Ho Chi Minh City 715100, Vietnam

NTT Hi-Tech Institute, Nguyen Tat Thanh University, Ho Chi Minh City 700000, Vietnam
Faculty of Applied Sciences, Ho Chi Minh University of Technology and Education, 720700 Ho Chi Minh City, Vietnam.

A-12 ***17:00 – 17:15*** **SPECTROSCOPIC PROPERTIES OF ANTHOCYANINS IN PURPLE SWEET POTATOES**

Nguyen Thi Thu Hien, Trang Huynh Dang Khoa, Bui Quoc Trung, Le Mai Trinh, Dinh Thi Hai Thuan, Dinh Son Thach
Ho Chi Minh City University of Industry and Trade, Ho Chi Minh City, Vietnam
Graduate University of Science and Technology, Vietnam

A-13 **17:15 - 17:30** **PHYSICAL MULTI-LAYER MODEL FOR DETERMINISTIC IMAGE RECONSTRUCTION THROUGH HIGHLY SCATTERING MEDIA**

Dinh Hoang Tran, Thi Van Anh Nguyen, Sungsam Kang, Jin Hee Hong, and Wonshik Choi
Department of Physics, Korea University, Seoul 02841, Republic of Korea

A-14 **17:30 - 17:45** **CONFOCAL REFLECTANCE ENDOMICROSCOPE THROUGH A FLEXIBLE FIBER BUNDLE VIA ADAPTIVE PHASE CORRECTION**

Tran Thinh Le, Anh, Taeil Yun, Hoang, Danial Yang, Youngwoon Choi, and Wonshik Choi
Department of Physics, Korea University, Seoul 02841, Republic of Korea

19:00 – 20:00 WELCOME CONFERENCE PARTY

SESSION A:

PHOTONICS & APPLICATIONS

October 02, 2026 (Friday) - Hall B - 1st Floor

Chairperson:

Prof. Joo Jae Young (Korea Photonics Techn. Institute, Republic of Korea)
Prof. Tran Quoc Tien (IMS, VAST)

A-15
08:00 - 08:20 **HIGH-EFFICIENCY CERAMIC PHOSPHORS FOR LASER LIGHTING: SUPPRESSION OF PROCESS-INDUCED CARBON CONTAMINATION**
(Invited Talk)

Noriko Chikumoto, Hisashi Minemoto, Hiroshi Fuji, Kazuhiko Yamamoto
Institute of Laser Engineering, The University of Osaka, 2-6 Yamadaoka, Suita, Osaka 565-0871, Japan

A-16
08:20 - 08:40 **BIAS VOLTAGE FREQUENCY DEPENDENCE OF THE TERAHERTZ EMISSION SPECTRAL CHARACTERISTICS OF GaAs PHOTOCONDUCTIVE ANTENNA DEVICES**
(Invited Talk)

Orlee Catay, Joshua Omar Pestaño, Joaquin Ivan Cedrick Verona, Arcturus Gabriel Mendenilla, Gian Carlo Carrillo, John Paul Ferrolino, Masaki Yoshimura, Aito Tamura, Arvin Lester Cornejo Jusi, Ryosuke Onogi, Yuta Shimizu, Mary Clare Escaño, Hideaki Kitahara, Masahiko Tani, Hannah Bardolaza, Armando Somintac, Arnel Salvador, and Elmer Estacio
National Institute of Physics, University of the Philippines Diliman, Quezon City, Philippines
Research Center for Development of Far-Infrared Region, University of Fukui, Japan

A-17
08:40 - 09:00 **CURRENT STATUS OF ZHAGA STANDARDIZATION OF KOREAN LIGHTING TECHNOLOGY**
(Invited Talk)

Meeryoung Cho
Digital Lighting Research Division, Korea Photonics Technology Institute, 9, Cheomdan Venture-ro 108beon-gil, Buk-gu, Jeonnam-Gwangju Special Metropolitan City

A-18
09:00 - 09:20 **PHOTOLUMINESCENCE-BASED BIOSENSING OF URIC ACID AND DOPAMINE USING SEMICONDUCTOR NANOMATERIALS: ZnO, CuO, AND g-C_3N_4**
(Invited Talk)

Hanh Hong Mai, Tuan Duy Nguyen Duc, Loan Le Thi
Faculty of Electronics and Communications, University of Engineering and Technology, Vietnam National University, Hanoi, Vietnam
Faculty of Physics, University of Science, Vietnam National University, Hanoi, Vietnam

A-19
09:20 - 09:35 **RECENT ADVANCES IN OXIDE-BASED PHOTOELECTRODES FOR SOLAR WATER SPLITTING: PERSPECTIVES FROM OUR RESEARCH**

Hoang V. Le, Duc N. Nguyen, Ly T. Le, Phong D. Tran
Institute of Science and Technology, TNU-University of Sciences, Thai Nguyen, Vietnam.
University of Science and Technology of Hanoi, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Hanoi, 100000 Vietnam.

A-20
09:35 – 09:50 **CHIRAL EDGE-STATE SIGNATURES OF BERRY MONOPOLE MERGING AND SPLITTING IN A BILAYER PHOTONIC CRYSTAL SLAB WITH SYNTHETIC MOMENTUM**

Ngoc Duc Le, D.-H.-Minh Nguyen, Dung Xuan Nguyen, Hai Son Nguyen, Dario Bercioux
Donostia International Physics Center, 20018 Donostia-San Sebastián, Spain
Institute of Physics, Vietnam Academy of Science and Technology, 10 Dao Tan, Giang Vo, Ha Noi, Viet Nam
Univ. Lille, CNRS, UMR 8523-PhLAM-Physique des Lasers Atomes et Molécules, F-59000 Lille, France
Advanced Polymers and Materials: Physics, Chemistry and Technology, Chemistry Faculty (UPV/EHU), Paseo M. Lardizabal 3, 20018 San Sebastian, Spain
Center for Theoretical Physics of Complex Systems, Institute for Basic Science (IBS), Daejeon, 34126, Republic of Korea
Institute for Interdisciplinary Research in Science and Education, ICISE, Quy Nhon, Vietnam
Ecole Centrale de Lyon, CNRS, INSA Lyon, Université Claude Bernard Lyon 1, CPE Lyon, CNRS, INL, UMR5270, Ecully 69130, France
CNRS-International-NTU-Thales Research Alliance (CINTRA), IRL 3288, Singapore 637553, Singapore
Institut Universitaire de France (IUF), 75231 Paris, France
IKERBASQUE, Basque Foundation for Science, Euskadi Plaza, 5, 48009 Bilbao, Spain

09:50 - 10:00 **COFFEE BREAK**

Chairperson:

Prof. Baoping Zhang (Southern Univ. of Science and Technology, China)
Prof. Nguyen Thanh Binh (Institute of Physics, VAST)

A-21
10:00 - 10:20 **ANALYSIS OF BENZODIAZEPINES BY GAS CHROMATOGRAPHY COUPLED WITH FEMTOSECOND LASER IONIZATION MASS SPECTROMETRY**
(Invited Talk)

Totaro Imasaka, Cheng-Huang Lin, Katsunori Yoshinaga, and Tomoko Imasaka
Kyushu University, Fukuoka, Japan
Faculty of Design, Kyushu University, Fukuoka, Japan

A-22
10:20 - 10:40 **TERAHERTZ EMISSION AND DETECTION FROM LT-GaAs PHOTOCONDUCTIVE ANTENNA WITH AlAs CONFINEMENT LAYER**
(Invited Talk)

Lourdes Nicole Dela Rosa, Gerald Angelo Catindig, Jose Mari Sebastian Arcilla, Ivan Cedrick Verona, John Paul Ferrolino, Roni Andig, Dean Von Johari Narag, Jonel Francisco, Gian Carlo Carrillo, Craig Egan Allistair Tan, Hong Minh Pham, Mary Clare Escaño, Hannah Bardolaza, Armando Somintac, Hideaki Kitahara, Masahiko Tani, Arnel Salvador, and Elmer Estacio
National Institute of Physics, University of the Philippines Diliman, Quezon City, Philippines
Materials Science and Engineering Program, University of the Philippines, Diliman, Quezon City, Philippines
Institute of Physics, Vietnam Academy of Science and Technology, Hanoi, Vietnam
Research Center for Development of Far-Infrared Region, University of Fukui, Japan

A-23
10:40 – 11:00 **EFFECT OF ANNEALING TEMPERATURE ON THE STRUCTURE AND PROPERTIES OF CROSSLINKED PVA/STARCH MEMBRANES WITH g-C_3N_4 NETWORK AND PHOTOCATALYTIC PROPERTY TESTING**
(Invited Talk)

Nguyen Son, La Thi Bich Dao, Pham Do Chung, Le Thi Mai Oanh, Nguyen Van Minh
Hanoi National University of Education, 136 Xuan Thuy, Cau Giay, Hanoi

A-24
11:00 - 11:15

pH- AND TEMPERATURE-DEPENDENT CONFORMATIONAL REMODELING OF AMYLOID-β42 IN LIPID MEMBRANES: EVIDENCE FROM CIRCULAR DICHROISM, RAMAN SPECTROSCOPY, AND MOLECULAR DYNAMICS SIMULATIONS

Khlood A. A. Abdeljawaad, Yersultan Arynbek, Kahramon Mamatkulov, Huy Le Duc, and Grigory Arzumanyan
Joint Institute for Nuclear Research, Dubna, Russia
Academy of Scientific Research & Technology (ASRT), Cairo, Egypt
Chemistry Department, Faculty of Science, Minia University, Minia, Egypt

A-25
11:15 – 11:30

SIMULATION AND PARAMETERIZATION OF CHERENKOV-PHASE-MATCHED EO SAMPLING IN $LiNbO_3$ FOR THz DETECTION

Gabrielle D. Fernandez, Lourdes Nicole F. Dela Rosa, Hannah R. Bardolaza, and Elmer S. Estacio
National Institute of Physics, University of the Philippines Diliman, Quezon City, Philippines

A-26
11:30 – 11:45

SOLUTION PLASMA-ASSISTED PREPARATION OF STABLE GO–AgNP NANOFLUIDS WITH ENHANCED THERMAL AND PHOTOTHERMAL PERFORMANCE

Nguyen Thi Ngoc Mai, Do Tuan, Pham Van Nhat, Pham The Tan, Phan Ngoc Minh, Pham Van Trinh, Nguyen Van Hao
Thai Nguyen University of Sciences, Thai Nguyen, Vietnam
Institute of Materials Science, Vietnam Academy of Science and Technology, Hanoi, Vietnam
University of Science and Technology of Hanoi, VAST, Hanoi, Vietnam
Hung Yen University of Technology and Education, Hung Yen, Vietnam
Graduate University of Science and Technology of Hanoi, VAST, Hanoi, Vietnam

A-27
11:45 – 12:00

BLADE: BROADBAND LOW-FREQUENCY ASTRONOMICAL DETECTION EXPERIMENT - SYSTEM DESIGN, SITE SURVEY, AND SCIENCE CASE FOR A NEW RADIO TELESCOPE IN VIETNAM

Khoi Doan-Minh, Quang Nguyen-Luong, Hien Phan-Thanh, Viet Dung Pham
Institute for Astronomy and Space Quantum Communications (IAS), Vietnam
Simons Astrophysics Group at ICISE, Institute for Interdisciplinary Research in Science and Education (IFIRSE), ICISE, 07 Science Avenue, Quy Nhon Nam, Gia Lai, Vietnam
Université Paris-Saclay, Université Paris Cité, CEA, CNRS, AIM, 91191 Gif-sur-Yvette, France
University of Science and Technology of Hanoi, Hanoi, Vietnam
Center for Space Technology Research and Development, Vietnam National Space Center, Hanoi, Vietnam

A-28 **INVESTIGATION OF A SAFE HYDROTHERMAL ETCHING**
12:00 – 12:15 **PROCESS FOR MXenes ($Ti_3C_2T_x$) SYNTHESIS FROM Ti_3AlC_2 MAX PHASE**

Thi-Yen Giap, Thi-Thu Quynh, Do-Chung Pham, Thi-Mai-Oanh Le, Thi-Hang Lam
Department of Physics, Hanoi National University of Education, 136 Xuan Thuy Street, Cau Giay District, Hanoi, Vietnam.

12:15 - 13:30 LUNCH (at Hai Au Hotel)

Chairperson:

Prof. Chang-Lyoul Lee (APRI, GIST, Republic of Korea)
Prof. Le Van Doai (Vinh University, Vinh, VN)

A-29 **SIMULATIONS OF QUANTUM BLOCH-ZENER**
13:30 - 13:50 **OSCILLATIONS WITH BINARY WAVEGUIDE ARRAYS**
(Invited Talk)

Truong X. Tran
Department of Physics, Le Quy Don Technical University, 236 Hoang Quoc Viet street, Hanoi, Vietnam

A-30 **ALL-OPTICAL SWITCHING AND ULTRAFAST**
13:50 - 14:10 **DEMAGNETIZATION IN $NiCo_2O_4$ THIN FILMS**
(Invited Talk)

Ryunosuke Takahashi, Kaede Yamada, Harjinder Singh, Yann Le Guen, Kanata Watanabe, Suguru Nakata, Junta Igarashi, Julius Hohlfeld, Jon Gorchon, Grégory Malinowski, Lingling Xie, Daisuke Kan, Yuichi Shimakawa, Takayuki Ishibashi, Stéphane Mangin, and Hiroki Wadati
Department of Materials Science, Univ. of Hyogo, Ako, Hyogo 678-1297, Japan
Institut Jean Lamour, CNRS UMR 7198, Universit´e de Lorraine, F-54506 Nancy, France
Department of Electrical, Electronics and Information Engineering, Nagaoka University of Technology, Nagaoka 940-2188, Japan
Institute for Chemical Research, Kyoto University, Uji, Kyoto 611-0011, Japan
Division of Applied Chemistry, Graduate School of Engineering, The University of Osaka, Suita 565-0871, Osaka, Japan.
Center for Science and Innovation in Spintronics, Tohoku University, Sendai, Japan
Institute of Laser Engineering, Osaka University, Suita, Osaka 565-0871, Japan

A-31
14:10 - 14:30

DECOUPLING LIGHT–MATTER INTERACTIONS: DIELECTRIC METASURFACES FOR SHAPING PEROVSKITE NANOCRYSTAL EMISSION

(Invited Talk)

Quynh Le-Van

VinUni-Illinois Smart Health Center, VinUniversity, Hanoi, Vietnam.

Centre of Materials Innovation and Technology, VinUniversity, Hanoi, Vietnam

Center for Environmental Intelligence, VinUniversity, Hanoi, Vietnam

College of Engineering and Computer Science, VinUniversity, Hanoi, Vietnam

A-32
14:30 - 14:45

EXPLOITATION OF CHERENKOV-PHASE MATCHED OPTICAL RECTIFICATION IN THE SIMULATION AND PARAMETRIZATION OF THz GENERATION IN BULK LN CRYSTALS

Aldrin D. Correa, Lourdes Nicole F. Dela Rosa, Hannah R. Bardolaza, and Elmer S. Estacio

National Institute of Physics, University of the Philippines Diliman, Quezon City, Philippines

A-33
14:45 - 15:00

EFFECTS OF HYDROTHERMAL CONDITIONS ON OPTICAL PROPERTIES OF GRAPHENE QUANTUM DOTS DERIVED FROM GLUCOSE/CITRIC ACID/GLUTAMIC ACID

Duong Huynh Thanh Linh, Nguyen Minh Quan, Vo Nguyen Quoc Cuong, Nguyen Thi Thu Hien, Tran Boi An, Dinh Son Thach, Nguyen Thi Thu Hien

Institute of Advanced Technology, Vietnam

Graduate University of Science and Technology, Vietnam

Ho Chi Minh City Univ. of Industry and Trade, Ho Chi Minh City, Vietnam

A-34
15:00 - 15:15

DESIGN, COMMISSIONING, AND OPTICAL CHARACTERIZATION OF A HIGH-RESOLUTION MODULAR ASTRONOMICAL SPECTROGRAPH AT QUY NHON OBSERVATORY

Phan Thanh Hien, Nguyen Thi Thao, Nguyen Van Tue, Le Quang Thuy

University of Science and Technology of Hanoi, Vietnam Academy of Science and Technology, Hanoi, Vietnam

Vietnam National Space Center, Vietnam Academy of Science and Technology, Hanoi, Vietnam

ExploraScience Quy Nhon, Gia Lai Department of Science and Technology, Vietnam

A-35 **15:15 - 15:30** **MODERATE-TERAHERTZ-INDUCED PLATEAU EXPANSION OF HIGH-ORDER HARMONIC GENERATION TO SOFT X-RAY REGION**

Doan-An Trieu
Institute of Fundamental and Applied Sciences, Duy Tan University, Vietnam

15:30 – 15:45 **COFFEE BREAK**

Chairperson:

Prof. Yeongkyo Seo (Inha University, Republic of Korea)
Prof. Ngoc Diep Lai (Université Paris-Saclay, France)

A-36 **15:45 - 16:05** **PREDICTIONS OF HIGH TEMPERATURE PRESSURE-BROADENING COEFFICIENTS FOR EXOPLANET ATMOSPHERE STUDIES**
(Invited Talk)

Ha Tran, Faten Hendaoui, Pascale Chelin, Xavier Landsheere
Laboratoire de Météorologie Dynamique, IPSL, Sorbonne Université, École Normale Supérieure, Université PSL, École polytechnique, Institut Polytechnique de Paris, CNRS, Paris, France
Université de Tunis, Laboratoire de Spectroscopie et Dynamique Moléculaire, École Nationale Supérieure d'Ingénieurs de Tunis, 5 Av. Taha Hussein, 1008 Tunis, Tunisia
Univ Paris Est Créteil and Université Paris Cité, CNRS, LISA, F-94010 Créteil, France

A-37 **16:05 - 16:25** **OPTIMIZING THE COMPOSITION OF STRONTIUM BARIUM ZINC BORATE GLASS DOPED WITH Eu_2O_3 FOR X-RAY IMAGING APPLICATIONS**
(Invited Talk)

C. Mutuwong, P. Meejitpaisan, W. Chaiphaksa, F. Khrongchaiyaphum, P. Pakawanit, C. Phoovasawat, W. Cheewasukhanont, S. Kothan, and J. Kaewkhao
Physics Program, Faculty of Science and Technology, Nakhon Pathom Rajabhat University, Nakhon Pathom 73000, Thailand
Center of Excellence in Glass Technology and Materials Science (CEGM), Nakhon Pathom Rajabhat University, Nakhon Pathom 73000, Thailand
Synchrotron Light Research Institute (Public Organization), 111 University Avenue, Nakhon Ratchasima 30000, Thailand
Center of Radiation Research and Medical Imaging, Department of Radiologic Technology, Faculty of Associated Medical Sciences, Chiang Mai University, Chiang Mai 50200, Thailand
Office of Research Administration, Chiang Mai University, Chiang Mai 50200, Thailand

A-38 **TIME SCALE REALISATIONS USING OPTICAL ATOMIC**
16:25 - 16:45 **CLOCKS**
(Invited Talk)

Dang-Bao-An Tran, Daniela Weston, Douglas Jones, Jacob Tunesi
Time and Frequency Department, Quantum and Timing Business Unit, National Physical Laboratory
Hampton Road, Teddington, TW11 0LW, United Kingdom

A-39 **OPTICAL AND LUMINESCENCE PERFORMANCE OF RICE**
16:45 - 17:00 **HUSK ASH DERIVED SAMARIUM-DOPED BOROSILICATE GLASSES FOR LED ENCAPSULATION**

Nattaporn Mahingsa, Nattapon Srisittipokakun, Jakrapong Kaewkhao and Keerati Kirdsiri
Physics Program, Faculty of Science and Technology, Nakhon Pathom Rajabhat University, Nakhon Pathom, 73000, Thailand
Center of Excellence in Glass Technology and Material Science (CEGM), Nakhon Pathom Rajabhat University, Nakhon Pathom, 73000, Thailand

A-40 **HIGH-SMSR TUNABLE OPTICAL MODE FILTERING USING**
17:00 - 17:15 **AN EDFA AND ODL INTEGRATED VERNIER CAVITY FOR THz-WAVE GENERATION**

Masayuki Higaki, Yoshiaki Nakajima, Yu Tokizane, Eiji Hase, Naoya Kuse, Takeshi Yasui
Institute of Post-LED Photonics (pLED), Tokushima University, 2-1, Minami-Josanjima, Tokushima 770-8506, Japan
Department of Physics, Toho University, 2-2-1 Miyama, Funabashi, Chiba 274-8510, Japan

A-41 **BLADE PCB FRONT-END MODULE**
17:15 - 17:30

Nguyen Tung Lam, Pham Viet Dung, Phan Thanh Hien, Nguyen Luong Quang
Department of Space and Earth Science, University of Science and Technology of Ha Noi, A21 building, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Nghia Do Ward, Hanoi

17:30-17:45 **OFFICIAL CLOSING**

SESSION B

OPTICS AND SPECTROSCOPY

SESSION B:

OPTICS AND SPECTROSCOPY

October 01, 2026 (Thursday) - Meeting Room B - 2nd Floor

Chairperson:

Prof. Tran Xuan Truong (Le Quy Don University)
Prof. Mitsuru Inada (Kansai University, Japan)

B-01
13:30 - 13:50

PHOTOPHYSICS AND PHOTOREDOX REACTIVITY OF A METAL - FREE TRIAZATRIANGULENIUM PHOTOSENSITIZER
(Invited Talk)

Daniel H. Cruz Neto, Thi Huyen My Dang, Jérôme Fortage, Marie-Noëlle Collomb, Philippe P. Lainé, Annamaria Quaranta, Zakaria Halime, Thomas Pino, Eric Vauthey, Minh-Huong Ha-Thi
Institut des Sciences Moléculaires d'Orsay (ISMO), Université Paris-Saclay, CNRS - Orsay, France
Department of Physical Chemistry, University of Geneva - Geneva, Switzerland
Département de Chimie Moléculaire (DCM), Université Grenoble Alpes, CNRS - Grenoble, France
iTODYS, Université Paris-Cité, CNRS - Paris, France
Institute for Integrative Biology of the Cell (I2BC), Université Paris-Saclay, CEA, CNRS - Gif-sur Yvette, France
Institut de Chimie Moléculaire et des Matériaux d'Orsay (ICMMO), Université Paris-Saclay, CNRS - Orsay, France

B-02
13:50 - 14:10

RGB-AND MULTI-SPECTRAL SENSORS FOR INTELLIGENT AND ADAPTIVE LIGHTING SOLUTIONS IN BUILDINGS AND GREENHOUSES
(Invited Talk)

Tran Quoc Khanh, Felix Wirth
Adaptive Lighting systems and Visual Processing, Technical University Darmstadt, Germany

B-03 **14:10 - 14:30** **EXTREME FIELD GENERATION IN STRUCTURED TARGETS VIA RELATIVISTIC LASER-PLASMA INTERACTIONS**
(Invited Talk)

Myles Allen H. Zosa, Arrianne Norfela Logarta, and Jessa Jayne Miranda
National Institute of Physics, University of the Philippines Diliman, Quezon City, NCR 1101, Philippines

B-04 **14:30 - 14:50** **PROBING ELECTRONIC STRUCTURE, LOCAL COORDINATION, AND DYNAMIC RECONSTRUCTION IN FUNCTIONAL MATERIALS BY MULTI-EDGE X-RAY ABSORPTION SPECTROSCOPY**
(Invited Talk)

Luc Huy Hoang
Hanoi National University of Education

B-05 **14:50 - 15:05** **SIZE-SELECTED VO_2 NANOPARTICLES ENABLING TUNABLE PLASMONIC AND THERMOCHROMIC BEHAVIOR FOR SMART GLAZING**

Thi Hang Hoang, Amirmostafa Amirjani, Didier Grandjean, Minh Vuong Nguyen, Kristiaan Temst, Loan Le Thi Ngoc, Ewald Janssens
Quantum Solid State Physics, Department of Physics and Astronomy, KU Leuven, 3001 Leuven, Belgium.
Department of Physics-Materials Science, Faculty of Natural Sciences, Quy Nhon University, Quy Nhon, Vietnam.
IMEC, Kapeldreef 75, 3001 Leuven, Belgium.

B-06 **15:05 - 15:20** **THE LASER-INDUCED DAMAGE OF A CMOS IMAGE SENSOR**

Doan Cat Cong, Nguyen Thi Thu Huong, Nguyen Trong Nghia
Graduate University of Science and Technology, 18 Hoang Quoc Viet Road, Hanoi, Vietnam.
Institute of Physics, Vietnam Academy of Science and Technology, 10 Dao Tan Road, Giang Vo, Hanoi, Vietnam.
Tay Ho high school, 41 Phu Thuong road, Phu Thuong, Hanoi, Vietnam.

B-07 **15:20 – 15:35** **ULTRASENSITIVE OPTICAL DETECTION OF DOPAMINE USING A Nafion/UiO-66-NH_2/ZnO HYBRID MEMBRANE COUPLED WITH The FOX2 ASSAY**

Pham Van Thanh, Do Van Dang, Hanh Hong Mai
Faculty of Physics, University of Science, Vietnam National University, Hanoi, Vietnam
Faculty of Chemistry, University of Science, Vietnam National University, Hanoi, Vietnam
Faculty of Electronics and Communications, University of Engineering and Technology, Vietnam National University, Hanoi, Vietnam

15:35-15:45 **COFFEE BREAK**

Chairperson:

Prof. Noriko Chikumoto (ILE, The University of Osaka, Japan)
Prof. Tran Quoc Khanh (Technical University Darmstadt, Germany)

B-08 **QUANTUM COMMUNICATION IN THAILAND**
15:45 – 16:05 *(Invited Talk)*

Pruet Kalasuwan
Prince of Songkla University, Thailand

B-09 **SINTERING TEMPERATURE AND Eu^{3+}/Bi^{3+} DOPING EFFECTS**
16:05-16:25 **ON THE STRUCTURAL AND PHOTOLUMINESCENCE PROPERTIES OF CaY_2O_4 PHOSPHORS**
(Invited Talk)

Chu Viet Ha, Vu Thi Kim Lien, Bui Nguyen Hoang Anh, Pham Anh Thu, Pham Mai An, Le Tien Ha
TNU-University of Education, Thai Nguyen, Vietnam
Institute of Theoretical and Applied Research, Duy Tan University, Ha Noi, 100000, Viet Nam
School of Engineering and Technology, Duy Tan University, Da Nang, 550000, Viet Nam
TNU-University of Sciences, Thai Nguyen, Vietnam

B-10 **OPTICAL CHARACTERIZATION AND APPLICATIONS OF**
16:25– 16:45 **COMPOUND SEMICONDUCTORS**
(Invited Talk)

Kazunobu Kojima
Graduate School of Engineering, The University of Osaka, Yamada-oka 2-1, Suita, Osaka, Japan

B-11 **MODEL-BASED MULTILAYER RECONSTRUCTION FOR**
16:45 - 17:00 **LENSLESS FIBER-BUNDLE HOLOGRAPHIC ENDOSCOPY**

Thi Van Anh Nguyen, Tran Thinh Le, Dinh Hoang Tran, Taeseok Daniel Yang, Youngwoon Choi and Wonshik Choi
Department of Physics, Korea University, Seoul 02841, Republic of Korea
Department of Bioengineering, Korea University, Seoul 02841, Republic of Korea
Interdisciplinary Program in Precision Public Health, Korea University, Seoul 02841, Republic of Korea

B-12 **17:00 – 17:15** **EXTENDING THE LIMITS OF FREQUENCY METROLOGY: HIGH-PRECISION MID-INFRARED ROVIBRATIONAL SPECTROSCOPY OF TRIOXANE**

Dang-Bao-An Tran, Pierre Asselin, Andrey Goncharov, Alexander Shelkovnikov, Sean K Tokunaga, Olivier Lopez, Anne Amy-Klein, Mathieu Manceau, and Benoît Darquié
Université Sorbonne Paris Nord, Laboratoire de Physique des Lasers, LPL, CNRS, UMR 7538, F-93430, Villetaneuse, France
Sorbonne Université, CNRS, MONARIS, UMR 8233, Paris, France
Current address: Time and Frequency Department, Quantum and Timing Business Unit, National Physical Laboratory, TW11 0LW, Teddington, United Kingdom

B-13 **17:15 - 17:30** **EXPERIMENTAL CHARACTERIZATION OF CHROMATIC DISPERSION IN SILICA-BASED PHOTONIC CRYSTAL FIBER USING A MACH–ZEHNDER INTERFEROMETER**

Tham Hong Tran, Linh Nguyen Thuy, Hue Thi Nguyen, Bien Chu Van, Ngoc Vo Thi Minh, Phuong Nguyen Thi Hong, The Tai Le Xuan, Lanh Chu Van, Van Thuy Hoang, Hieu Van Le
Department of Physics, Vinh University, 182 Le Duan, Truong Vinh Ward, Nghe An Province, Viet Nam
Faculty of Natural Sciences, Hong Duc University, 565 Quang Trung, Hac Thanh Ward, Thanh Hoa Province, Vietnam
Yersin Da Lat University, 27 Ton That Tung, Lam Vien Ward, Lam Dong Province, Vietnam
Faculty of Physics and Chemistry, The University of Danang, University of Science and Education, Da Nang Province, Vietnam
Atomic Molecular and Optical Physics Research Group, Science and Technology Advanced Institute, Van Lang University, Ho Chi Minh City, Vietnam

B-14 **17:30 - 17:45** **PROSPECT FROM MONITORING LIGHTNING STRIKE WITH BURSTT**

Cuong Pham-Ngoc and Quang Nguyen-Luong
Institute for Astronomy and Space Quantum Communications (IAS), Vietnam
Simons Astrophysics Group at ICISE, Institute for Interdisciplinary Research in Science and Education (IFIRSE), ICISE, 07 Science Avenue, Quy Nhon Nam, Gia Lai, Vietnam
Universit´e Paris-Saclay, Universit´e Paris Cit´e, CEA, CNRS, AIM, 91191 Gif-sur-Yvette, France

19:00 – 20:00 WELCOME CONFERENCE PARTY

SESSION B:

OPTICS AND SPECTROSCOPY

October 02, 2026 (Friday) - Meeting Room B - 2nd Floor

Chairperson:

Prof. Kazunobu Kojima (The University of Osaka, Osaka, Japan)
Prof. Nguyen Dinh Lam (VNU-Univ. of Engi. and Techn., Vietnam)

B-15
08:00 - 08:20 **CONCENTRATION-DEPENDENT ENERGY TRANSFER IN Tb^{3+} AND Dy^{3+} DUAL-ACTIVATED PHOSPHOSILICATE OXYFLUORIDE GLASSES FOR PHOTONIC APPLICATION**
(Invited Talk)

P. Meejitpaisan, Ramachari Doddoji, S. Kothan, H. J. Kim, J. Kaewkhao
Physics Program, Faculty of Science and Technology, Nakhon Pathom Rajabhat University, Nakhon Pathom, 73000, Thailand
Center of Excellence in Glass Technology and Materials Science (CEGM), Nakhon Pathom Rajabhat University, Nakhon Pathom, 73000, Thailand
Institute of Research and Development, Duy Tan University, Da Nang 550000, Vietnam
Faculty of Natural Sciences, Duy Tan University, Da Nang 550000, Vietnam
Center of Radiation Research and Medical Imaging, Department of Radiologic Technology, Faculty of Associated Medical Sciences, Chiang Mai University, Chiang Mai, Thailand
Department of Physics, Kyungpook National University, Daegu, 41566, Republic of Korea

B-16
08:20 - 08:40 **NOISE-AWARE OPTIMIZATION OF QUANTUM COMPUTING SYSTEM**
(Invited Talk)

Yeongkyo Seo
Inha University, Republic of Korea

B-17 **08:40 - 09:00** **DEVELOPMENT OF ACHROMATIC NANOSTRUCTURED MICRO-VORTEX PHASE COMPONENTS USING COMMERCIAL GLASSES**
(Invited Talk)

Hue Thi Nguyen
Hong Duc University, 565 Quang Trung, Thanh Hoa, Vietnam

B-18 **09:00 - 09:20** **MBE GROWTH OF InGaAsSb FOR SWIR PHOTODETECTORS AND MID-INFRARED LEDs**
(Invited Talk)

Tien Dai Nguyen, Vu Thi Bich, Pham Van Duong, Nguyen Thanh Binh, Bui Hong Van, Jun Oh Kim, and Sang Jun Lee
Institute of Theoretical & Applied Research, Duy Tan Univ., Hanoi, Vietnam
Institute of Physics, 10 Dao Tan, Giang Vo, Hanoi, Vietnam
VNU Univ. of Sciences (HUS-VNU), Hanoi, Vietnam
Division of Interdisciplinary Materials Measurement Institute, Korea Research Institute of Standard Science, Daejeon, 34113, South Korea

B-19 **09:20 - 09:35** **DUAL-WAVELENGTH UPCONVERSION IN RARE-EARTH-DOPED CaF_2 FOR NIR-TO-MIR INFRARED DETECTION**

Ziyao Wang, Yugo Akabe, Keito Shinohara, Marilou Cadatal-Raduban, Akira Yoshikawa, Toshihiko Shimizu, Kosaku Kato, Verdad C.Agulto, Makoto Nakajima, Nobuhiko Sarukura, Benchaphorn Damdee, Jakrapong Kaewkhao, Kohei Yamanoi
Institute of Laser Engineering, Osaka University, 2 -6 Yamadaoka, Suita, Osaka 565-0871, Japan
Unitec Institute of Technology, 139 Carrington Road, Mount Albert, Auckland 1025, New Zealand
Institute for Material Research, Tohoku University, 2 -1-1, Sendai 980-8577, Japan
Center of Excellence in Glass Technology and Materials Science, Nakhon Pathom Rajabhat University, Nakhon Pathom, 73000, Thailand

B-20 **09:35 – 09:50** **FAST ADAPTIVE OPTICS FLUORESCENCE MICROSCOPY FOR IN VIVO HIGH-RESOLUTION IMAGING IN DEPTH**

Alexandra Fragola
Institut des Sciences Moléculaires d'Orsay (ISMO), Paris Saclay University (Orsay, France)

09:50 - 10:00 **COFFEE BREAK**

Chairperson:

Prof. Le Vu Tuan Hung (Science University - VNUHCM)
Prof. Satoki Matsushita (Inst. of Astronomy &Astrophysics (ASIAA), Taiwan)

B-21
10:00 - 10:20 **SELLMEIER DISPERSION OF SUCROSE SOLUTIONS FOR REFRACTIVE INDEX MEASUREMENT**
(Invited Talk)

Mayuko Koga, Hiroki Nakata, Hanayo Takenaka, Yugo Akabe, Marilou Cadatal-Raduban, Nobuhiko Sarukura, Noriko Chikumoto and Toshihiko Shimizu
Graduate school of Engineering, University of Hyogo, Himeji, Hyogo 671-2280, Japan
Institute of Laser Engineering, The University of Osaka, Suita, Osaka 565-0871, Japan
Unitec Institute of Technology, 139 Carrington Road, Auckland, 1025 New Zealand

B-22
10:20 - 10:40 **FROM DEFECT STATES TO HETEROINTERFACES: ENGINEERING OPTICAL RESPONSE IN OXIDE SEMICONDUCTOR NANOSTRUCTURES**
(Invited Talk)

Trinh Duc Thien, Le T.M. Cham, Mai Van Tuan, Nguyen Dang Co, Ho Thi Anh, Pham Van Vinh, Nguyen Duc Cuong, Nguyen Tuan Canh, Duong Van Pham, Minh Hong Pham, Nguyen Dinh Lam
Faculty of Physics, Hanoi National University of Education, 136 Xuan Thuy Road, Cau Giay District, Hanoi, 100000, Vietnam
Faculty of Engineering Physics and Nanotechnology, VNU-University of Engineering and Technology, 144 Xuan Thuy Road, Cau Giay District, Hanoi, 100000, Vietnam
Faculty of Natural Sciences, Electric Power University, 235 Hoang Quoc Viet, Bac Tu Liem District, Hanoi, Vietnam
Institute of Physics, Vietnam Academy of Science and Technology, 10 Dao Tan, Hanoi, Vietnam

B-23
10:40 – 11:00 **ODD–EVEN HIGH-HARMONIC GENERATION AS A SYMMETRY-RESOLVED PROBE OF INTRINSIC MOLECULAR ASYMMETRY: FROM SPECTRA TO SUB-CYCLE INTERFEROMETRY**
(Invited Talk)

Kim-Ngan H. Nguyen, Thanh Tran, Doan-An Trieu, Duong D. Hoang-Trong, Cam-Tu Le, Lan Nguyen Tran, Van-Hoang Le & Ngoc-Loan Phan
Duy Tan University, Vietnam
Ho Chi Minh City University of Education, Vietnam
Van Lang University, Vietnam
Ton Duc Thang University, Vietnam
University of Science, Vietnam National Univ.y, Ho Chi Minh City Vietnam

B-24
11:00 - 11:20 **SPECTROSCOPY OF ISOLATED COLD DEPROTONATED CHLOROPHYLLS PIGMENTS BY ELECTRON PHOTODETACHMENT**

(Invited Talk)

Ali Muheddine, Niloufar Shafizadeh, Benoit Soep
ISMO Université Paris Saclay

B-25
11:20 – 11:35 **LIGHT YIELD AND SCINTILLATION DECAY TIME OF Ce^{3+} DOPED SILICO-PHOSPHATE GLASS FOR ALPHA DETECTION**

Nolaphan Paprajong, Wuttichai Chaiphasa, Jakrapong Kaewkhao
Physics Program, Faculty of Science and Technology, Nakhon Pathom Rajabhat University, Nakhon Pathom, 73000, Thailand
Center of Excellence in Glass Technology and Material Science (CEGM), Nakhon Pathom Rajabhat University, Nakhon Pathom, 73000, Thailand

B-26
11:35 – 11:50 **EXPLORATION OF THE PROPERTIES OF Fe, Ni, Co NANOCOMPOSITE POWDERS SYNTHESIZED BY THE CHEMICAL-METALLURGICAL METHOD WITH VARIABLE NICKEL-CONTENT**

Nguyen Tien Hiep, Nguyen Van Minh, Gopalu Karunakaran, Nguyen Manh Hung
Department of Materials Science and Engineering, Le Quy Don Technical University, Hanoi, Vietnam
Institute of Technology, Hanoi, Vietnam
Department of Biotechnology, K.S. Rangasamy College of Arts and Science, KSR Kalvi Nagar, Tiruchengode-637-215, Namakkal Dist, Tamil Nadu, India

B-27
11:50 – 12:05 **ADVANCE OPTICAL FIBER SENSORS BASED ON NANOCOMPOSITES/MULTILAYER MATERIALS FOR SENSITIVE DETECTION OF ENVIRONMENTAL HAZARDS**

Tran Thi Nhu Hoa, Hanh Kieu Thi Ta, Le Hong Tho, Trinh Kieu The Loan, Do Thao Anh, Nguyen Khanh Vi, Ly Hoang Chau, Nguyen Thi Kieu Vy, Bach Thang Phan
Faculty of Materials Science and Technology, University of Science, Ho Chi Minh City, Viet Nam
Vietnam National University, Ho Chi Minh City, Viet Nam
Advanced Materials Technology Institute Vietnam National University Ho Chi Minh City, Ho Chi Minh City Vietnam
University of Health Sciences, Vietnam National University Ho Chi Minh City, Viet Nam

B-28 **A STUDY OF Er:SiO_2 CLAD ON THIN Si-PADDED Si_3N_4**
12:05 – 12:20 **WAVEGUIDES**

Gia Kien Ngo, Ming-Chang M. Lee, Minh Quy Tran, Quang Anh Do
Faculty of Engineering Physics, University of Engineering and Technology, Vietnam National University, 144 Xuan Thuy Street, Cau Giay Ward, Hanoi, Vietnam
Department of Electrical Engineering and Institute of Photonics Technologies, National Tsing Hua University, No.101, Section2, Kuang-Fu Road, Hsinchu, Taiwan 30013, China
Faculty of Physics, Hanoi University of Science, Vietnam National University, 334 Nguyen Trai Street, Thanh Xuan Ward, Hanoi, Vietnam

12:20 - 13:30 **LUNCH (at Hai Au Hotel)**

Chairperson:

Prof. Mayuko Koga (University of Hyogo, Japan)
Prof. Vu Thi Bich (Duy Tan University, Vienam)

B-29 **PHYSICS-INFORMED MACHINE LEARNING FOR**
13:30 - 13:50 **UNDERSTANDING ELECTRONIC DIELECTRIC RESPONSE IN OXIDE MATERIALS**
(Invited Talk)

Mega Novita
Graduate Program of Natural Science Education, Universitas PGRI Semarang, Jl. Sidodadi Timur No. 24 Semarang 50232, Central Java Indonesia

B-30 **GROWTH OF OVER 3-INCH β-Ga_2O_3 BULK SINGLE**
13:50 - 14:10 **CRYSTALS UNDER PRECIOUS-METAL-CRUCIBLE-FREE CONDITIONS**
(Invited Talk)

Akira Yoshikawa, Taketoshi Tomida, Vladimir V. Kochurikhin, Yasuhiro Shoji, Kei Kamada, Masanori Kitahara, Ken Inada, Koichi Kakimoto
Tohoku University, 2-1-1 Katahira, Aoba-ku, Sendai, 980-8577, Japan
C&A Corporation, 1-16-23, Ichibancho, Aoba-ku, Sendai, 980-0811, Japan
FOX Corporation, 1-12-2 Ichibancho, Aoba, Sendai, 980-0811, Japan

B-31 **14:10 - 14:30** **ASSEMBLY OF SONOCHEMICALLY SYNTHESIZED $Ti_3C_2T_x$ MXene ONTO LASER-INDUCED GRAPHENE FOR FLEXIBLE ENERGY STORAGE AND SENSING APPLICATIONS**
(Invited Talk)

Ye Chan, Shwe Yi Poe Eain, Hnin Wutyi
University of Yangon, Myanmar, 11014

B-32 **14:30 - 14:45** **GREENLAND TELESCOPE (GLT): TECHNICAL DEVELOPMENT FOR BLACK HOLE SHADOW IMAGING**
(Invited Talk)

Satoki Matsushita
Academia Sinica, Institute of Astronomy & Astrophysics (ASIAA), Taiwan

B-33 **14:45 - 15:00** **GREEN-EMITTING Tb^{3+}-DOPED GLASSES FOR DISPLAY DEVICES APPLICATIONS**

P. Saengka, N. Srisittipokakun, J. Kaewkhao
Physics program. Faculty of Science and Technology, Nakhon Pathom Rajabhat University, Nakhon Pathom 73000 Thailand.
*Center of Excellence in Glass Technology and Material Science (CEGM), Nakhon Pathom Rajabhat University, Nakhon Pathom, **73000**, Thailand*

B-34 **15:00 - 15:15** **BEYOND LOCALIZATION IN SUPER-RESOLUTION MICROSCOPY: FROM 3D POSITION TO MOLECULAR IDENTITY**

S. Lévêque-Fort
ISMO, Université Paris-Saclay, CNRS, UMR 8214, Orsay, France

B-35 **15:15 - 15:30** **GAS-MEDIATED STRUCTURAL EVOLUTION OF g-C3N4 UNDER HIGH PRECURSOR LOADING IN A QUASI-CONFINED SYSTEM: BALANCING POLYCONDENSATION AND FRAMEWORK ACCESSIBILITY**

Dao-Lan Bui, Thai-Son Than, Thi-Mai-Oanh Le, Do-Chung Pham
Faculty of Physics, Hanoi National University of Education, 136 Xuan Thuy Road, Cau Giay Ward, Hanoi, Viet Nam

15:30 – 15:45 **COFFEE BREAK**

Chairperson:

Prof. Mega Novita (Universitas PGRI Semarang, Indonesia)
Prof. Mai Hong Hanh (VNU-Univ. of Eng. and Techn., Vietnam)

B-36 **LABEL FREE DISEASE MODEL ANALYSIS BASED ON 1700 nm**
15:45 - 16:05 **SPECTROSCOPIC OCT IMAGING SYSTEM**
(Invited Talk)

Tae Joong Eom
Department of Cogno-Mechatronics Engineering, Pusan National University, Busan 46241, Korea
Department of Optics&Mechatronics Engineering, Pusan National University, Busan 46241, Korea
Engineering Research Center for Color-modulated Extra-sensory Perception Technology, Pusan National University, Busan 46241, Korea

B-37 **ADVANCED NANOMATERIALS@QNU-ASSMD: FROM**
16:05 - 16:25 **MATERIALS DESIGN TO PRACTICAL APPLICATIONS**
(Invited Talk)

Thanh Hai Phan, Nhat Hieu Hoang, Van Nghia Nguyen, Minh Vuong Nguyen, Vien Vo, Thi Ngoc Loan Le, Thi Xuan Huynh Nguyen, Thao Vien Le and Thi Mien Trung Huynh
Advanced semiconductor matatials and devices group, Quy Nhon University (QNU-ASSMD), 170 An Duong Vuong, Quy Nhon Nam, Gia Lai

B-38 **WIDE-RANGE VISIBLE PHOTOLUMINESCENCE OF Nb**
16:25 - 16:45 **NANOPARTICLES AND EL DEVICE APPLICATIONS**
(Invited Talk)

Mitsuru Inada, Shumpei Toyoshima, Akito Mizobata and Yasushi Obora
Dep. Pure and Applied Physics, Kansai University, 3-3-35 Yamatecho, Suita, Osaka 564-8680, Japan
Dep. Chemistry and Materials Engineering, Kansai University, 3-3-35 Yamatecho, Suita, Osaka 564-8680, Japan

B-39
16:45 – 17:00 **FUNDAMENTAL DISSIPATIVE SOLITONS WITH CUBIC–QUINTIC–SEPTIC NONLINEARITIES IN CONVENTIONAL AND $\mathcal{PT}$-SYMMETRIC GAIN–LOSS LANDSCAPES**

Tran Ky Vi, Le Xuan The Tai, Bui Duc Tinh, Tran Ngoc Bao, and Nguyen Viet Hung

School of Materials Science and Engineering, Hanoi University of Science and Technology, 1 Dai Co Viet Street, Hai Ba Trung District, Hanoi 100000, Vietnam.

Atomic, Molecular and Optical Physics Research Group, Science and Technology Advanced Institute, Van Lang University, 69/68 Dang Thuy Tram Street, Binh Thanh District, Ho Chi Minh City 700000, Vietnam.

Faculty of Applied Technology, Van Lang School of Technology, Van Lang University, 69/68 Dang Thuy Tram Street, Binh Thanh District, Ho Chi Minh City 700000, Vietnam.

Faculty of Physics, Hanoi National University of Education, 136 Xuan Thuy Street, Cau Giay District, Hanoi 100000, Vietnam.

Faculty of Mathematics and Informatics, Hanoi University of Science and Technology (HUST), 1 Dai Co Viet Street, Hanoi 100000, Vietnam.

B-40
17:00 - 17:15 **ALUMINUM-MODIFIED GRAPHITIC CARBON NITRIDE FOR EFFICIENT REMOVAL OF TETRACYCLINE FROM AQUEOUS SOLUTION**

Nguyen Tien Dung, Doan Viet Tuyen, Than Thai Son, Bui Dao Lan, Lam Thi Hang, Le Thi Mai Oanh, Pham Do Chung, Nguyen Van Minh

Faculty of Physics, Hanoi National University of Education, 136 Xuan Thuy, Cau Giay Ward, Hanoi, Vietnam, 100000

Faculty of Applied Sciences and Engineering, Electric Power University, 235 Hoang Quoc Viet, Nghia Do Ward, Hanoi 10000, Vietnam

B-41
17:15 - 17:30 **BURSTT DEVELOPMENT AND ANALYSIS: TRANSFER OF CALIBRATION WITH NOISE SOURCE EMITTER**

Thanh Thy Bui-Le, Kai-Yang Lin

International University - Vietnam National University Ho Chi Minh City, Vietnam

Institute of Astronomy & Astrophysics, Academia Sinica, Taipei, Taiwan

17:30 - 17:45 OFFICIAL CLOSING

SESSION POSTER

SESSION POSTER I

October 01, 2026 (Thursday)

13:30 - 17:30

<u>Chairperson:</u>

Prof. Chu Van Lanh (Vinh Univ., Vietnam)
Prof. Le Van Hieu (Hong Duc University, Vietnam)

PI-01 REAL-TIME MONITORING OF O_3 DEGRADATION UNDER LABORATORY CONDITIONS USING A DOAS SYSTEM BASED ON A MODELESS Ce:LiCAF LASER

Quan Le Minh, Tu Xuan Nguyen, Diep Van Nguyen, Nobuhiko Sarukura, Minh Hong Pham
Institute of Physics, Vietnam Academy of Science and Technology, 10 Dao Tan, Ba Dinh, Hanoi, Vietnam
Tran Quoc Tuan University, Xuan Phuong, Hanoi, Vietnam
Institute of Laser Engineering, Osaka University, 2–6 Yamadaoka, Suita, Osaka 565–0871 Japan
Faculty of Education, Ha Tinh University, Cam Binh, Ha Tinh, Viet Nam

PI-02 OPTICAL DESIGN AND PERFORMANCE EVALUATION OF AN F-θ LENS FOR HIGH-SPEED LASER PROCESSING SYSTEMS

Vo Quang Sang
Department of Optical Devices, Le Quy Don Technical University

PI-03 STRUCTURAL AND CS_2-INFILTRATION EFFECTS ON CONFINEMENT LOSS IN $As_{39}Se_{61}$ SUSPENDED-CORE FIBERS

Hong Phuong Nguyen Thi, Lanh Chu Van, Thien Nguyen Minh, Tham Tran Hong, Nam Nguyen Trong, Vinh Nguyen Thanh, Hai Hoang Dinh, Yen Vo Thi Hong, Nhan Duong Truyen, Ben Chu Van
Department of Physics, Vinh University, Nghe An, Vietnam
Nghe An University, No 51 Ly Tu Trong street, Vinh Phu Ward, Nghe An Province
Chau Thanh 1 High School, National Route 80, Tan Nhuan Dong Commune, Dong Thap, Vietnam
Nguyen Thi Dieu High School, 12 Tran Quoc Toan Street, Xuan Hoa Ward, Ho Chi Minh City, Vietnam.
Faculty of Electronic Engineering I, Posts and Telecommunications Institute of Technology, Hanoi, Vietnam

PI-04 FABRICATION OF PERIODIC MICRO/NANO STRUCTURE USING TWO-PHOTON DIRECT LASER WRITING AND METAL SPUTTERING

Xuan Bach NGUYEN
University of Science and Technology of Hanoi, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Cau Giay, Hanoi

PI-05 STABILIZATION of KERR MICROCOMB REPETITION RATE by USING FIBER REFERENCE

R. Shikata, T. Mori, M. Talara, Y. Tokizane, M. Higaki, E. Hase, I., N. Kuse, and T. Yasui
Tokushima Univ., 2-1, Minami-Josanjima, Tokushima 770-8506, Japan

PI-06 COMPARATIVE STRUCTURE, OPTICAL AND ELECTRICAL CHARACTERISTICS OF SOL-GEL-DEPOSITED Mn-, Co-, AND Sn-DOPED CuO THIN FILMS

Nguyen Van Loi, Vu Thi Huyen Trang
Academy of Cryptography Techniques, Department of Foundation, 141 Chien Thang, Thanh Liet, Hanoi, Vietnam
Vietnam National University, Hanoi, University of Science, Faculty of Physics, 334 Nguyen Trai, Thanh Xuan, Hanoi, Vietnam.
Dai Nam University, Faculty of Pharmacy, 1 Pho Xom, Phu Luong, Hanoi, Vietnam

PI-07 DEVELOPMENT OF IMAGE QUALITY EVALUATION CRITERIA FOR EYEPIECES USED FOR MICRODISPLAY VIEWING IN AIMING AND OBSERVATION DEVICES

Nguyen Duc Tung
Institute of Defense Equipment, Academy of Military Science and Technology

PI-08 FABRICATION AND PERFORMANCE OF A LOW-COST ZnO-BASED UV SENSOR ON PCB

Toan Van Nguyen, Duc -Nam Duyen Ha, Tue-Nghia Thac Nguyen, Sam Linh Duong, Minh Quang Nguyen, Huy Minh Nguyen, Phat Gia Vu, Hung Dang Nguyen and Nam Thanh Nguyen
Department of Physics, Le Quy Don Technical University, Hanoi, Vietnam
Le Quy Don High School, Hanoi, Vietnam
Hanoi – Amsterdam High School for the Gifted, Hanoi, Vietnam
Nguyen Tat Thanh High School, Hanoi, Vietnam
Quang Trung High School, Hanoi, Vietnam
Pham Hong Thai High School, Hanoi, Vietnam
HUS High School for Gifted Students, VNU University of Science, Hanoi, Vietnam

PI-09 SU-8 MICROFIBER LASERS FABRICATED BY DIRECT DRAWING

Son Huy Le, Toan Van Nguyen, and Van Duong Ta
Faculty of Engineering and Environment, Hanoi Metropolitan University, Hanoi, Vietnam
Department of Quantum Optics, Faculty of Physics, Vietnam National University, Hanoi, Vietnam
Department of Physics, Le Quy Don Technical University, Hanoi, Vietnam
Department of Optical Devices, Le Quy Don Technical University, Hanoi, Vietnam

PI-10 EFFECT OF OXYGEN-NITROGEN ANNEALING ENVIRONMENT ON PHOTOELECTRIC PROPERTIES OF CuO THIN FILMS FABRICATED BY SPUTTERING

Vu Thi Huyen Trang, Nguyen Van Loi
Dai Nam University, Faculty of Pharmacy, 1 Pho Xom, Phu Luong, Hanoi, Vietnam
Academy of Cryptography Techniques, Department of Foundation, 141 Chien Thang, Thanh Liet, Hanoi, Vietnam
Vietnam National University, Hanoi, University of Science, Faculty of Physics, 334 Nguyen Trai, Thanh Xuan, Hanoi, Vietnam.

PI-11 SIZE-CONTROLLED POROUS PVA MICROSPHERES FOR MICROSCALE RANDOM LASERS

Lien Thi Ngo, Tien Van Nguyen, Lien Ha Thi Nghiem, Van Duong Ta
Graduate University of Science and Technology, Vietnam Academy of Science and Technology, Hanoi, Viet Nam
Department of Physics, Le Quy Don Technical University, Hanoi, Viet Nam
Institute of Physics, Vietnam Academy of Science and Technology, Hanoi, Vietnam
Department of Optical Devices, Le Quy Don Technical University, Hanoi, Vietnam

PI-12 INTERFERENCE-BASED NONLINEAR OPTICAL TWEEZERS FOR DYNAMICALLY SCALABLE 2D NEUTRAL ATOM ARRAYS

Anh Tuan Nguyen, Tien Bao Tran, Thanh Lam Nguyen and Vu Nam Le
Institute of Defense Equipment, Academy of Military Science and Technology, Hanoi, Vietnam

PI-13 GROUP VELOCITY DISPERSION CONTROL IN AN $AS_{38.8}SE_{61.2}$-BASED SUSPENDED-CORE PHOTONIC CRYSTAL FIBER WITH CS_2-FILLED AIR HOLES

Thien Nguyen Minh, Lanh Chu Van, Tham Tran Hong, Nam Nguyen Trong, Thuy Le Thi, Vinh Nguyen Thanh, Hai Hoang Dinh, Khanh Huynh Nhat, Thuy Hoang Van, Ben Chu Van
Department of Physics, Vinh University, Nghe An, Vietnam
Nghe An University, No 51 Ly Tu Trong street, Vinh Phu Ward, Nghe An Province
Phan Van Hoa High School, Hamlet 6, Cai Ngang Commune, Vinh Long Province, Vietnam.
Faculty of Electronic Engineering I, Posts and Telecommunications Institute of Technology, Hanoi, Vietnam

PI-14 EFFECTS OF SUPPLEMENTAL LED LIGHTING DURATION ON GROWTH AND BIOACTIVE PROPERTIES OF PATCHOULI (POGOSTEMON CABLIN) ESSENTIAL OIL

Thi Nghiem Vu, Ha Thi Thu Chu, Tran Quoc Tien, Pham Van Truong
Faculty of Natural Sciences, Electric Power University, Ha Noi, Viet Nam
Institute of Materials Science, Vietnam Academy of Science and Technology (VAST), 18.Hoang Quoc Viet, Nghia Do, Ha Noi, Viet Nam
Institute of Biology, VAST, 18.Hoang Quoc Viet, Nghia Do, Ha Noi, Viet Nam

PI-15 TAILORING THE FUNCTIONALITIES OF NEAR-INFRARED SURFACE PLASMON RESONANCES IN HYBRID METAL-DIELECTRIC METASURFACES

Dinh Hoai Nam, Ngo Quang Minh
University of Science and Technology of Hanoi, A21 Building, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Cau Giay, Hanoi.

PI-16 ENHANCED EXTERNAL QUANTUM EFFICIENCY IN SILICON-BASED PHOTODETECTOR VIA A LAYER-BY-LAYER PHOTO-MULTIPLICATION HETEROJUNCTION

Manh Hoang Tran
Institute of Advanced Technology, Vietnam Academy of Science and Technology, 1B TL29 Street, An Phu Dong Ward, Ho Chi Minh City 700000, Viet Nam

PI-17 EFFECT OF GAUSSIAN BEAM WAIST ON SPHERICAL ABERRATION IN NONLINEAR ASPHERICAL LENSES

Pham Thanh Quang, Ho Quang Quy
Academy of Military Science and Technology, 17 Hoang Sam Nghia Do Ha Noi

PI-18 LASER WAVELENGTH SELECTION AND PARAMETER DESIGN FOR LONG-RANGE ELECTRO-OPTICAL DETECTION

Pham Thanh Quang
Academy of Military Science and Technology, 17 Hoang Sam, Nghia Do, Ha Noi

PI-19 PHOTONIC EXCITATION-AWARE META-INITIALIZATION FOR MOLECULAR VQE UNDER GEOMETRY-INDUCED CORRELATION SHIFT

Lenh Phan Cong Pham, Vinh Phong Vo
Department of Information Technology, FPT University, Can Tho City, Vietnam
Institute for Astronomy and Space Quantum Communications (IAS), Vietnam

PI-20 OPTICAL TRANSITIONS AND EXCITED-STATE DYNAMICS OF MoS_2 QUANTUM DOTS REVEALED BY STEADY-STATE AND TIME-RESOLVED SPECTROSCOPY

Vo Hoang Vu, Nguyen Duc Hai, Tran Duc Minh, Do Minh Hieu, Nguyen Thi Khanh Van, Pham Van Duong, Nguyen Thi Thuy, Nguyen Duc Son, Hoang Bao Long

Thien Ho Duong High School, 640 National Route 62, Kien Tuong, Tay Ninh Province, Vietnam

The Faculty of Physics, VNU University of Science, Hanoi, 12116, Vietnam

Institute of Physics, Vietnam Academy of Science and Technology, 10 Dao Tan Street, Giang Vo, Hanoi, Vietnam

Hung Yen University of Technology and Education, Hung Yen Province, Vietnam

VNU University of Engineering and Technology UET2 Building, VNU University of Engineering and Technology, VNU Town, Hoa Lac Commune, Hanoi, Vietnam

PI-21 SIMULATION THE STABLE SPACE OF LOW – INDEX NANOPARTICLE UNDER HOLLOW- GAUSSIAN BEAM TRAP

Cong Mai Nguyet, Quy Ho Quang, Quang Ho Dinh, Nhue Phan Nguyen, Kien Bui Xuan

Academy of Military Science and Technology, 17 Hoang Sam, Ha Noi

Vinh University, 182 Le Duan, Truong Vinh, Nghe An

Military Technical Academy, 100 Hoang Quoc Viet, Hanoi

Electric Power University, 235 Hoang Quoc Viet, Ha Noi

PI-22 DESIGN, DEVELOPMENT AND PERFORMANCE EVALUATION OF A LOW-COST HANDHELD THERMAL CAMERA BASED ON THE MLX90640 INFRARED SENSOR

Phan Nguyen Nhue, Duong Chi Dung, Bui Dinh Bao, Vo Quang Sang, Vo Thanh Hai, Phan Thi Minh Hao, Nguyen Minh Hue

Department of Optical Devices, Le Quy Don Technical University

Faculty of Physics, Le Quy Don Technical University, Hanoi, Vietnam

PI-23 DESIGN AND EXPERIMENTAL EVALUATION OF A 940-nm FREE-SPACE OPTICAL LINK FOR AUDIO AND LOW-RATE DATA TRANSMISSION

Vo Thanh Hai, Duong Chi Dung, To Minh Hao, Nguyen Tran Long Khanh, Nguyen Minh Hue, Phan Nguyen Nhue

Department of Optical Devices, Le Quy Don Technical University

Faculty of Physics, Le Quy Don Technical University, Hanoi, Vietnam

PI-24 DESIGN AND EXPERIMENTAL CHARACTERIZATION OF A QUADRANT PHOTODETECTOR RECEIVER FOR LASER SPOT TRACKING

Le Di Khang, Duong Chi Dung, Nguyen Minh Hue, Phan Nguyen Nhue

Department of Optical Devices, Le Quy Don Technical University

Faculty of Physics, Le Quy Don Technical University, Hanoi, Vietnam

PI-25 SIZE-CONTROLLED FABRICATION AND OPTICAL PROPERTIES OF INKJET-PRINTED PVA/RHODAMINE B MICROSPHERES

Tien Van Nguyen, Lien Thi Ngo, Duy Thanh Nguyen, Toan Duc Nguyen, Lien Ha Thi Nghiem, Van Duong Ta

Department of Physics, Le Quy Don Technical University, Hanoi, Viet Nam

Graduate University of Science and Technology, Vietnam Academy of Science and Technology, Hanoi, Viet Nam

Institute of Physics, Vietnam Academy of Science and Technology, Hanoi, Vietnam

Department of Optical Devices, Le Quy Don Technical University, Hanoi, Vietnam

PI-26 ADVANCED OPTICAL SENSORS BASED ON PLASMONIC NANOMATERIALS FOR ENVIRONMENTAL MONITORING

Le Thanh Tam, Le Hong Tho, Hanh Kieu Thi Ta, Do Thao Anh, Kieu The Loan Trinh, Hieu Trung Vu, Tran Tan Phat, Le Vu Ha, Le Thi Huyen Thuong, Nguyen Hinh Bien Gioi, Bach Thang Phan, Tran Thi Nhu Hoa

Faculty of Materials Science and Technology, University of Science, Ho Chi Minh City, Vietnam

Vietnam National University, Ho Chi Minh City, Vietnam

Advanced Materials Technology Institute Vietnam National University Ho Chi Minh City, Ho Chi Minh City Vietnam

University of Health Sciences, Vietnam National University Ho Chi Minh City, Vietnam

PI-27 STABLE SPACE OF THE DIELECTRIC NANOPARTICLE IN NONLINEAR OPTICAL TWEZERS

Nam Tran Hai, Thang Nguyen Manh, Kien Bui Xuan

VNU University of Science, High School for Gifted Students, 182 Luong The Vinh, Hanoi,Vietnam

Academy of Military Science and Technology, 17 Hoang Sam, Nghia Đo, Hanoi, Vietnam

Electric Power Univessity, 235 Hoang Quoc Viet, Nghia Đo, Hanoi, Vietnam

PI-28 DESIGN AND NUMERICAL INVESTIGATION OF A NOVEL Ce:LiCAF LASER CAVITY FOR TUNABLE DUAL-WAVELENGTH NARROW-LINEWIDTH UV EMISSION

Diep Van Nguyen, Quan Le Minh, Tu Xuan Nguyen, Nobuhiko Sarukura, Minh Hong Pham

Institute of Physics, Vietnam Academy of Science and Technology, 10 Dao Tan, Ba Dinh, Hanoi, Vietnam

Tran Quoc Tuan University, Xuan Phuong, Hanoi, Vietnam

Institute of Laser Engineering, Osaka University, 2–6 Yamadaoka, Suita, Osaka 565–0871 Japan

PI-29 OPTICAL BISTABILITY IN A FOUR-LEVEL CASCADE-TYPE ATOMIC SYSTEM

Nguyen Van Ai, Luong Thi Yen Nga, Le Quang Trung, Nguyen Tuan Anh, Nguyen Thi Thu Hien, Trang Huynh Dang Khoa, Le Nguyen Mai Anh, and Le Van Doai

Ha Tinh University, 26/3 Street, Ha Tinh Province, Vietnam
Vinh University, 182 Le Duan Street, Nghe An Province, Vietnam.
Ho Chi Minh City University of Industry and Trade, Ho Chi Minh City, Vietnam
Nong Lam University, Ho Chi Minh City, Vietnam

PI-30 COMPARATIVE ANALYSIS OF THE EFFECTIVE MODE AREA IN PBG-08 GLASS SUSPENDED-CORE FIBERS WITH AIR-FILLED AND CS_2-INFILTRATED CONFIGURATIONS

Trong Dang Van, Bao Tran Le Tran, Cuong Phan Van, Duc Duoc Phan Nguyen, Nguyen Phan Nhat, Lanh Chu Van

School of Engineering and Technology, Nha Trang University, 02 Nguyen Dinh Chieu, Khanh Hoa Province, Vietnam
University of Khanh Hoa, 01 Nguyen Chanh, Khanh Hoa Province, Vietnam
Department of Physics, Vinh University182 Le Duan, Nghe An Province, Vietnam

PI-31 PROPAGATION CHARACTERISTICS AND DISPERSION PROPERTIES OF As_2Se_3 SUSPENDED-CORE FIBERS WITH VARYING BRIDGE-TO-CORE RATIO

Tran Le Tran Bao, Trong Dang Van, Xuan Huy Nguyen, Lanh Chu Van

Department of Education, University of Khanh Hoa, 01 Nguyen Chanh, Khanh Hoa Province, Vietnam
School of Engineering and Technology, Nha Trang University, 02 Nguyen Dinh Chieu, Khanh Hoa Province, Vietnam
Department of Physics, Vinh University, 182 Le Duan, Nghe An Province, Vietnam

PI-32 INFLUENCE OF NOMINAL pH ON STRUCTURE, MORPHOLOGY, OPTICAL AND PHOTOCATALYTIC PROPERTIES OF TiO_2

Do Khac Thinh, Hoang Nhat Linh, Nguyen Thi Thu Quynh, Giap Thi Yen, Lam Thi Hang, Nguyen Manh Hung, Le Thi Mai Oanh, Nguyen Van Minh

Faculty of Physics, Hanoi National Univ. of Education, 136 Xuan Thuy, Hanoi
Faculty of Basic Sciences, Hanoi Univ. of Mining and Geology, 18 Pho Vien, Hanoi
Faculty of Applied Sciences and Engineering, Electric Power University, 235 Hoang Quoc Viet, Hanoi

PI-33 CONCENTRATION- AND SOLVENT-DEPENDENT FLUORESCENCE PROPERTIES OF AMPHOTERICIN B FOR POTENTIAL PHOTOSENSITIZER APPLICATIONS

Pham Thi Lien, Tran Quoc Tien, Tong Quang Cong, Nguyen Thanh Huong, Hoang Thi Khuyen, Aliaksandr Mikulich, Raman Nahorny

Institute of Materials Science, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Nghia Do, Hanoi, Vietnam

B.I. Stepanov Institute of Physics of NASB, 68-2 Nezavisimosti Ave., Minsk, Belarus

PI-34 EFFECTS OF pH AND Eu^{3+} DOPING ON THE STRUCTURE, MORPHOLOGY, AND OPTICAL PROPERTIES OF $BiVO_4$

Bui Thanh Phong, Pham Thi Lien, Tong Quang Cong, Nguyen Thanh Huong, Hoang Thi Khuyen, Dinh Manh Tien, Nguyen Vu

University of Engineering and Technology, Vietnam National University, Hanoi, Vietnam

Institute of Materials Science, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Nghia Do, Hanoi, Vietnam

PI-35 SYNTHESIS, INVESTIGATION OF OPTICAL PROPERTIES OF TiO_2 NANOROD COMPOSITES FOR OPTOELECTRONIC APPLICATIONS

Nguyen Trung Kien, Duong Thuy Trang, Le Thi Kim Anh, To Phuong Linh, Bui Hong Van, Nguyen Van Manh, Pham Duy Long, Nguyen Duc San, Do Minh Hieu, Pham Van Duong, Tien Dai Nguyen, Vu Thi Bich

VNU University of Sciences, VVNU -Hanoi, 334 Nguyen Trai, Hanoi, Vietnam

Faculty of Chemical Techn., Hanoi University of Industry, 298 Cau Dien, Hanoi, Vietnam

Institute of Materials Science, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Hanoi

Institute of Physics, Vietnam Academy of Science and Technology, 10 Doi Can, Hanoi, Vietnam

Institute of Theoretical and Applied Research, Duy Tan University, Hanoi, Vietnam

PI-36 EFFECT OF CO INCORPORATION ON THE STRUCTURAL, OPTICAL, AND PHOTOCATALYTIC PROPERTIES OF $CuO/Zn_{1-x}Co_xO$ NANOCOMPOSITES

H.V. Thanh, N.T.M. Duyen, N.N. Huyen, L.T.M. Cham, D.T.N. Minh, T.D. Thien, M.V. Tuan, N.D. Lam

Faculty of Engineering Physics and Nanotechnology, VNU University of Engineering and Technology, 144 Xuan Thuy Road, Cau Giay District, Hanoi, 100000, Vietnam

Faculty of Physics, Hanoi National University of Education, 136 Xuan Thuy, Cau Giay District, Hanoi, 100000, Vietnam

PI-37 COBALT INDUCED MODULATION OF STRUCTURAL AND PHOTOCATALYTIC PROPERTIES IN $Cu_2O/Zn_{1-x}Co_xO$ HETEROSTRUCTURES

H. V. Thanh, L. T. T. Linh, N.T.M. Duyen, N.N. Huyen, L.T.M. Cham, D.T.N. Minh, T. D. Thien, M. V. Tuan, N. D. Lam
Faculty of Engineering Physics and Nanotechnology, VNU University of Engineering and Technology, 144 Xuan Thuy Road, Cau Giay District, Hanoi, 100000, Vietnam
Faculty of Physics, Hanoi National University of Education, 136 Xuan Thuy Road, Cau Giay District, Hanoi, 100000, Vietnam

PI-38 EFFECT OF METAL DOPING AND THERMAL TREATMENT ON THE STRUCTURE, SPECTROSCOPIC PROPERTIES, AND PHOTOCATALYTIC ACTIVITY OF Cu_2O

Mai Van Tuan, Trinh Duc Thien, Hoang Van Thanh, Le T.M. Cham, Pham Tuan Kien, Le Duc Tho, Nguyen Dinh Lam
Faculty of Engineering Physics and Nanotechnology, VNU University of Engineering and Technology, 144 Xuan Thuy Road, Cau Giay District, Hanoi, 100000, Vietnam
Faculty of Applied Sciences and Engineering, Electric Power University, 235 Hoang Quoc Viet, Nghia Do District, Hanoi, Vietnam
Faculty of Physics, Hanoi National University of Education, 136 Xuan Thuy Road, Cau Giay District, Hanoi, 100000, Vietnam

PI-39 EFFECTS OF CDOTS ON THE STRUCTURAL AND SPECTROSCOPIC PROPERTIES OF ZnO/Cu_2O NANOCOMPOSITES

Mai Van Tuan, Trinh Duc Thien, Hoang Van Thanh, Le T.M. Cham, Phi Ngoc Tuan, Le Quoc Duy, Le Doan Dung, Tran Van Cuong, Nguyen Nhu Duc, Dinh T.N. Minh, Nguyen Dinh Lam
Faculty of Engineering Physics and Nanotechnology, VNU University of Engineering and Technology, 144 Xuan Thuy Road, Cau Giay District, Hanoi, 100000, Vietnam
Faculty of Applied Sciences and Engineering, Electric Power University, 235 Hoang Quoc Viet, Nghia Do District, Hanoi, Vietnam
Faculty of Physics, Hanoi National University of Education, 136 Xuan Thuy Road, Cau Giay District, Hanoi, 100000, Vietnam

PI-40 MLP SURROGATE-ASSISTED OPTIMIZATION OF BRAGG MIRRORS WITH REDUCED INTERFACE ELECTRIC-FIELD INTENSITY FOR HIGH-POWER LASER APPLICATIONS

Nguyen Van Ba, Nguyen Van Thuong, Luong Van Cuong, Ngo The Vinh
School of Mechanical and Automotive Engineering, Hanoi University of Industry, Hanoi, Vietnam
Academy of Military Science and Technology, Hanoi, Vietnam

PI-41 MULTIBAND THERMAL CAMOUFLAGE ENABLED BY BAYESIAN-OPTIMIZED METAMATERIAL EMITTERS

Nguyen Phon Hai, Nguyen Hai Anh, Bui Xuan Khuyen, Bui Son Tung, Vu Dinh Lam
Graduate University of Science and Technology, Vietnam Academy of Science and Technology, Hanoi, Vietnam
Faculty of Basic Sciences, Air Defense–Air Force Academy, Hanoi, Vietnam
Institute of Materials Science, Vietnam Academy of Science and Technology, Hanoi, Vietnam
Vietnam National Space Center, Vietnam Academy of Science and Technology, Hanoi, Vietnam

PI-42 FACILE SYNTHESIS OF METHYLAMMONIUM LEAD IODIDE PEROVSKITE NANOWIRES VIA A TWO-STEP DISSOLUTION-RECRYSTALLIZATION METHOD

Nguyen Xuan Thau, Phung Dinh Hoat, Nguyen Van Cuong, Nguyen Van Hoang, Tien-Anh Nguyen, and Pham Tien Hung
Department of Physics, Le Quy Don Technical University, No. 236 Hoang Quoc Viet Street, Nghia Do Ward, Hanoi 100000, Vietnam
Department of Materials Science and Engineering, Le Quy Don Technical University, No. 236 Hoang Quoc Viet Street, Nghia Do Ward, Hanoi 100000, Vietnam

PI-43 FACILE FABRICATION OF BiI_3 NANOPLATES FOR HIGHLY SELECTIVE NO_2 GAS SENSING AT ROOM TEMPERATURE

Hoang Minh Truong, Nguyen Huu Trang, Phung Dinh Hoat, Do Hong Minh, Nguy Phan Tin, Nguyen Ngoc Trung, and Pham Tien Hung
Department of Physics, Le Quy Don Technical University, No. 236 Hoang Quoc Viet Street, Nghia Do Ward, Hanoi 100000, Vietnam
Faculty of Engineering Physics, Hanoi University of Science and Technology, No. 01 Dai Co Viet Street, Bach Mai Ward, Hanoi 100000, Vietnam

PI-44 SUPERCONTINUUM GENERATION IN ETHANOL-INFILTRATED FOUR-HOLE SUSPENDED-CORE FIBERS

Toan Ngo Duc, Thuy Do Thanh, Anh Tran Thi Ngoc, Phong Bui Van, Hieu Le Manh, Thao Bach Vu Thu, Vinh Nguyen Thanh, Thuan Bui Dinh, Dung Nguyen Tien, Trung Le Canh
Vinh University, 182 Le Duan Street, Nghe An Province, Vietnam

PI-45 SYNTHESIS AND NEAR-INFRARED PHOTOLUMINESCENCE PROPERTIES OF Cr^{3+}-DOPED Zn_2SnO_4 PHOSPHOR

Dam Quang Hoc, Nguyen Van Quang, Le Tien Ha
TNU-University of Sciences, Thai Nguyen, Vietnam
Department of Chemistry, Hanoi Pedagogical Univ. 2, Phu Tho, Viet Nam

PI-46 EFFECT OF Eu^{3+} CONCENTRATION ON THE OPTICAL PROPERTIES AND JUDD-OFELT PARAMETERS OF $MgAl_2O_4:Eu^{3+}$ PHOSPHORS

Hoang Minh Tuan, Tran Quoc Xuan, Nguyen Van Quang, Le Tien Ha
TNU-University of Sciences, Thai Nguyen, Vietnam
Ha Long University, Quang Ninh, 20000, Vietnam
Department of Chemistry, Hanoi Pedagogical Univ. 2, Phu Tho, Viet Nam

PI-47 SELF-BROADENED LINE-SHAPE PARAMETERS OF CO_2 LINES AT ROOM TEMPERATURE

Nguyen Thanh Thao, Nguyen Thi Huyen Trang, Le Minh Thu, Le Cong Tuong, Ngo Ngoc Hoa
Faculty of physics, Hanoi National University of Education, 136 XuanThuy, CauGiay, Hanoi, Vietnam

PI-48 NEW LINE-SHAPE PARAMETERS OF CO LINES BROADENED BY AIR AT ROOM TEMPERATURE

Nguyen Thi Huyen Trang, Le Minh Thu, Le Cong Tuong, Ngo Ngoc Hoa
Faculty of Physics, Hanoi National University of Education, 136 XuanThuy, CauGiay, Hanoi, Vietnam

PI-49 ELECTRONIC STRUCTURE, VISIBLE-LIGHT RESPONSE AND PHOTO-FENTON ACTIVITY OF A 16-COMPONENT ULTRA-HIGH-ENTROPY RARE-EARTH ORTHOFERRITE

Bui Manh Long, Pham Kim Dao, Bui Anh Thuc, Pham Quang Hieu
Department of Special Chemical Synthesis Technology, Institute of Propellants and Explosives, 192 Duc Giang Street, Viet Hung Ward, Hanoi, Vietnam
Department of Electrochemical Technology, Institute of Materials, Biology and Environment, 17 Hoang Sam Street, Nghia Do Ward, Hanoi, Vietnam

PI-50 ELECTROMAGNETICALLY INDUCED TRANSPARENCY IN AN ASYMMETRIC FOUR-LEVEL N-TYPE Cs ATOMIC SYSTEM

Nguyen Van Phu, Nguyen Huy Bang, Luong Thi Yen Nga, Ho Hai Quang, Le Quang Trung, Phan Duc Thuan, Nguyen Thi Quynh Anh, Nguyen Thi Ngoc Anh and Le Van Doai
Vinh University, 182 Le Duan Street, Nghe An Province, Vietnam
Nam Dinh Univ. of Techn., Education, 172 Phu Nghia, Ninh Binh, Vietnam
Hong Lam Technology and Economics College, Nghe An Province, Vietnam

PI-51 COLOSSAL CROSS-KERR NONLINEARITY IN A FOUR-LEVEL CASCADE-TYPE ATOMIC SYSTEM

Le Van Doai, Dinh Xuan Khoa, Nguyen Thi Quynh Anh, Ho Hai Quang, Nguyen Van Ai, Phan Van Thuan, Nguyen Thi Thu Hien, and Thai Van Thanh

Vinh University, 182 Le Duan Street, Nghe An Province, Vietnam
Ha Tinh University, 26/3 Street, Ha Tinh Province, Vietnam
Department of Education and Training of Nghe An, Nghe An Province, Vietnam
Ho Chi Minh City University of Industry and Trade, Ho Chi Minh City, Vietnam
Vinh Long University of Technology and Education, 73 Nguyen Hue Street, Vinh Long Province, Vietnam

PI-52 AgAu NANOPARTICLES-ENRICHED ZnO NANOPLATES AS A SERS SUBSTRATE FOR THE SENSITIVE DETECTION OF METHYLENE BLUE

Thi Thu Ha Pham, Pham Thi Nga, Nguyen Thi Huong, Nguyen Dac Dien, Tran Thu Trang, Xuan Hoa Vu

Faculty of Sciences and Technology, TNU-University of Sciences, Phan Dinh Phung ward, Thai Nguyen province, Vietnam
Faculty of Secondary School, Hoa Lu University, 2 Xuan Thanh street, Hoa Lu ward, Ninh Binh province, Vietnam
Faculty of Occupational Safety and Health, Vietnam Trade Union University, 169 Tay Son street, Kim Lien ward, Hanoi city, Vietnam
Institute of Science and Technology, TNU-University of Sciences, Phan Dinh Phung ward, Thai Nguyen province, Vietnam

SESSION POSTER II

October 02, 2026 (Friday)

8:30 - 12:00

Chairperson:

Prof. Nguyen Van Hao (Thai Nguyen University of Sciences, Vietnam)
Dr. Le Canh Trung (Vinh University, Vietnam)

PII-01 HIGH PRECISION EXOPLANET TRANSIT PHOTOMETRY WITH A 0.5 m TELESCOPE: TECHNIQUES, DATA REDUCTION, AND PILOT OBSERVATIONS

Nguyen Thi Thao, Pham Nhat Thuyet
Nha Trang Observatory, Vietnam National Space Center, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Nghia Do, Ha Noi, Vietnam

PII-02 ENERGY TRANSFER PROCESS IN Ce^{3+}/Tb^{3+} CO-DOPED BARIUM MAGNESIUM SILICATE PHOSPHORS

Tran Thi Hong, Ho Van Tuyen, Ho Thi Thuy Ngan, Nguyen Thi Thu Ha, Tran Thi Kim Ngan, Dang Thi Kim Anh, Huynh Y Tuyet Lan, Nguyen Ha Quyen, Mai Thi Kieu Lien, Le Xuan Hung
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Institute of Research and Development, Duy Tan University, Da Nang, 550000, Vietnam
Faculty of Natural Sciences, Duy Tan University, Da Nang, 550000, Vietnam

PII-03 DEVELOPMENT AND EXPERIMENTAL INVESTIGATION OF A SAND-BASED THERMAL ENERGY STORAGE SYSTEM INTEGRATED WITH SOLAR ENERGY

Nam Thanh Nguyen, Cuong Vu Le, Bao-Hoang Nguyen Phan, Phuc Minh Bui, Binh Khang Vu, Hieu Minh Nguyen, and Toan Van Nguyen
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HUS High School for Gifted Students, Hanoi, Vietnam
Nguyen Hue High School for the Gifted, Hanoi, Vietnam
Hanoi-Amsterdam High School for the Gifted, Hanoi, Vietnam
Phan Huy Chu - Dong Da High School, Hanoi, Vietnam

PII-04 LUMINESCENCE PROPERTIES, JUDD–OFELT PARAMETERS, AND ENERGY TRANSFER MECHANISMS IN Tb^{3+}/Eu^{3+} CO-DOPED Zr-BDC METAL–ORGANIC FRAMEWORKS

Lam Thi Kieu Giang, Nguyen Thanh Huong, Pham Thi Lien, Hoang Thi Khuyen, Anna Świderska-Środa, Witold Łojkowski, and Łukasz Marciniak
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Institute of High Pressure Physics, Polish Academy of Sciences, Warsaw, Poland
Institute of Low Temperature and Structural Research, Polish Academy of Sciences, Wrocław, Poland

PII-05 DUAL-MODE PHOTOLUMINESCENCE PROPERTIES OF MULTI-LANTHANIDE-FUNCTIONALIZED GD-BASED METAL–ORGANIC FRAMEWORKS

Lam Thi Kieu Giang, Pham Thi Lien, Hoang Thi Khuyen, P. N. B. Tri, and G. Arzumany
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Frank Lab of Neutron Physics, Joint Institute for Nuclear Research, Dubna, Moscow, Russia

PII-06 THỦY TINH ALUMINOSILICATE PHA TẠP Mn^{2+}: QUY TRÌNH CHẾ TẠO VÀ TÍNH CHẤT QUANG

Hồ Văn Tuyến, Lê Xuân Hùng, Nguyễn Thị Phương Thảo, Trần Thị Hồng, Nguyễn Thị Thái An, Nguyễn Ngọc Trác, Lê Văn Khoa Bảo, Phan Văn Độ
Viện nghiên cứu & Phát triển Công nghệ cao, Đại học Duy Tân, Đà Nẵng, Việt Nam
Khoa Khoa học Tự nhiên, Đại học Duy Tân, Đà Nẵng, Việt Nam
Trường đại học Sư phạm, Đại học Đà Nẵng, Đà Nẵng, Việt Nam
Trường Cao đẳng Công nghiệp Huế, Huế, Việt Nam
Ban Khoa học Công nghệ, Đại học Duy Tân, Đà Nẵng, Việt Nam
Trường Đại học Thuỷ Lợi, Hà Nội, Việt Nam

PII-07 IN-SITU RAMAN–ELECTROCHEMICAL CORRELATION OF DOPAMINE OXIDATION ON Ag/ZnO/ITO Electrodes

Nguyen Hong Linh, Ho Thi Ngoc Diem, Nguyen Thanh Trung, Le Thi Thanh Lieu, Hoang Nhat Hieu, Nguyen Van Nghia, Le Thi Ngoc Loan
Faculty of Natural Sciences, Quy Nhon University, 70 An Duong Vuong, Quy Nhon Nam, Gia Lai, Vietnam

PII-08 FABRICATION OF AN MXene CHITOSAN-BASED ELECTROCHEMICAL SENSOR FOR NITRITE DETECTION IN WATER

Vu Quoc Trung, Nguyen Dang Phu, Luc Huy Hoang
Department of Physics, Hanoi National University of Education, 136 Xuan Thuy Street, Cau Giay District, Hanoi, Vietnam.

PII-09 EFFECT OF PRECURSORS AND HEAT TREATMENT ON THE PHOTOELECTROCHEMICAL WATER SPLITTING PERFORMANCE OF Fe_2O_3 PHOTOANODES

Tran Tuan Vu, Lai Nhat Tan, Nguyen Tien Hiep, Nguyen Dinh Chien, Tran Van Nghia, Nguyen Minh Hieu, Nguyen Manh Hung
Department of Materials Science and Engineering, Le Quy Don Technical University, 236 Hoang Quoc Viet street, Hanoi 100000, Vietnam
Faculty of Materials Science and Engineering, Phenikaa University, Yen Nghia, Ha Dong, Hanoi 12116, Vietnam

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A. L. Shmitsko, V. Y. Plavskii, A. I. Tretyakova, R. K. Nahorny, A. V. Mikulich, A. N. Sobchuk, T. S. Ananich, O. N. Dudinova, N. D. Prokopenko, L. G. Plavskaya
State Scientific Institution "B.I. Stepanov Institute of Physics of the National Academy of Sciences of Belarus", 68-2 Nezavisimosti Ave., 220072, Minsk, Republic of Belarus

PII-11 GOLD NANOARCHITECTURES FOR SERS-BASED TRACE DETECTION OF INDIVIDUAL DYES AND DYE MIXTURES

Khanh Duy Nguyen, Tri Minh Le, Cong Chi Vo, Vinh Quang Truong, Trung Minh Huynh, Hanh Thi Nguyen, Ngoc Van Le, Hung Vu Tuan Le
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Vietnam National University, Ho Chi Minh City, 700000, Vietnam

PII-12 FIRST-PRINCIPLES INSIGHTS INTO RAMAN SPECTRA, RASHBA SPIN SPLITTING, AND PHONON-LIMITED CARRIER MOBILITY IN 2D JANUS MATERIALS

Nguyen T. Hiep, Thinh D. Tran, Nguyen V. Hieu, Chuong V. Nguyen, Nguyen N. Hieu
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Physics Department, University of Education, Hue University, Hue, Viet Nam
The University of Danang – University of Science and Education, Da Nang, 550000, Vietnam
Le Quy Don Technical University, Ha Noi, Viet Nam

PII-13 EFFECT OF Co-DOPING ON THE STRUCTURAL, OPTICAL AND PHOTOCATALYTIC DEGRADATION PROPERTIES OF $Li_{2-x}Co_xTiO_3$

H.V. Thanh, L.D. Cuong, D.C. Chien, N.V. Tien, D.X.T. Hieu, P.T. Binh, T. D. Thien, N.D. Lam, T.A. Ho

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PII-14 MULTI-RESONANT NEAR-INFRARED ABSORPTION IN A SIZE-GRADED Au/SiO_2 METASURFACE

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Institute of Materials Science, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Cau Giay, Hanoi, Vietnam

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V. Plavskii, A. Sobchuk, A. Tretyakova, A. Mikulich, O. Dudinova, L. Plavskaya, T. Ananich, V. Knyukshto

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PII-17 DESIGN AND THERMAL COMPENSATION ANALYSIS OF A 10× DISCRETE-STEP ZOOM OPTICAL SYSTEM FOR COOLED MWIR THERMAL IMAGING

Tran Quoc Tuan, Le Ngoc Cuong, Thai Hoai Son

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PII-18 PATTERNS OF THE INHIBITORY EFFECT OF BLUE LIGHT ON THE GROWTH OF MICROORGANISMS OF THE GENUS *KLEBSIELLA*

V. Plavskii, A. Tretyakova, A. Mikulich, A. Sobchuk, L. Plavskaya, T. Ananich, O. Dudinova, I. Leusenka, S. Yakimchuk, N.V. Dudchik, O.A. Emelyanova, E. Zakhidov, I. Tadjibaev, M. Imomov

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PII-19 STUDY ON THE EFFECT OF CRYSTALLIZATION BEHAVIOR ON SOFT MAGNETIC PROPERTIES OF LASER-ANNEALED FINEMET RIBBONS

Tran Van Nghia, Tran Bao Trung, Vu Thang Long, Pham Thi Trang, Nguyen Manh Hung

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PII-20 FLUORESCENT-FILM IMAGING FOR TWO-DIMENSIONAL CHARACTERIZATION OF UVC LED RADIATION

Le Thi Thu Ngoc, Do Vu Bao Ngoc, Ngo Quynh Duc, Le Vu Tuan Hung, Ching-Cherng Sun

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PII-21 Ce-DOPED ZnO/Ag NANOSTRUCTURES AS SERS SUBSTRATES FOR MICROPLASTIC DETECTION

Pham Hoang Lam, Nguyen Thanh Dat, Luu Nguyen Quang Huy, Tran Le Anh Duc, Nguyen Bich Nhi, Nguyen Duy Khanh, Le Thi Thu Ngoc, Le Vu Tuan Hung

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PII-22 ADAPTIVE ILLUMINATION-CONTROLLED RESOLUTION ENHANCEMENT FOR OPTICAL MICROSCOPY

Van Nhu Le, Quang Thi Nguyen, Minh Duc Tong, Van Quan Pham, Minh Nghia Pham

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PII-23 STRUCTURAL AND OPTICAL PROPERTIES OF CdS:Tb^{3+} AND CdS:Tb^{3+}/ZnS CORE/SHELL QUANTUM DOTS

T. T. T. Huong, N. T. Kien, N. T. Hien, N. T. Luyen, D. T. V. Hien, L. X. Hung, N. T. Hanh, V. H. Yen, N. T. M. Thuy, and N. X. Ca

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Faculty of Engineering and Technology, TNU – University of Information and Communication Technology, Thai Nguyen, Vietnam

Faculty of Physics, TNU- University of Education, Thai Nguyen, Vietnam

PII-24 SYNTHESIS, STRUCTURAL, AND OPTICAL PROPERTIES OF TYPE-II ZnO/ZnS CORE–SHELL SEMICONDUCTOR QUANTUM DOTS

L. X. Hung, N. T. Hanh, N. T. Tung, N. T. T. Hoan, N. V. Truong, P. M. Tan, N. T. Hien, N. X. Ca

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PII-25 INVOLVEMENT OF REACTIVE OXYGEN SPECIES IN PHOTOINDUCED DAMAGE TO CURCUMIN-SENSITIZED TUMOUR CELLS

O. N. Dudinova, L. G. Plavskaya, N. D. Prokopenko, A. I. Tretyakova, A. N. Sobchuk, A. V. Mikulich, T. S. Ananich, Yu. V. Kruchenok, R. K. Nahorny, A. L. Shmitko, S. V. Yakimchuk, I. A. Leusenko, V. Yu. Plavskii

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Nam Nguyen Trong, Lanh Chu Van, Tham Tran Hong, Thien Nguyen Minh, Vinh Nguyen Thanh, Hai Hoang Dinh, Hoang Nguyen Huy, Huy Do Viet, Thanh Thai Doan, Ben Chu Van

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Chi Lang High School, Gia Lai Province, Vietnam
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Faculty of Electronic Engineering I, Posts and Telecommunications Institute of Technology, Hanoi, Vietnam

PII-27 CONTROLLING SYNCHRONOUS AND ANTI-SYNCHRONOUS OPTICAL SWITCHING UNDER RELATIVE PHASE AND EXTERNAL MAGNETIC FIELD

Thai Doan Thanh, Le Thi Minh Phuong, Nguyen Le Thuy An, Luong Thi Yen Nga, Dinh Xuan Khoa, Trang Huynh Dang Khoa, and Hoang Minh Dong

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Truong An Education Consulting Company Limited, Ho Chi Minh City, Vietnam
Vinh University, 182 Le Duan Street, Nghe An Province, Vietnam

PII-28 CONTROLLING OPTICAL BISTABILITY AND MULTISTABILITY UNDER HIGH-ORDER DISPERSION AND EXTERNAL MAGNETIC FIELD

Nguyen Tuan Anh, Nguyen Huy Bang, Le Nguyen Mai Anh, Nguyen Le Thuy An, Le Van Doai, Luong Thi Yen Nga, and Hoang Minh Dong

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Nong Lam University, Ho Chi Minh City, Vietnam
Truong An Education Consulting Company Limited, Ho Chi Minh City, Vietnam
Vinh University, 182 Le Duan Street, Nghe An Province, Vietnam

PII-29 INVESTIGATE THE SOLITON STORAGE AND RETRIEVAL IN AN ELECTROMAGNETICALLY INDUCED TRANSPARENCY MEDIUM

Nguyen Le Thuy An, Le Thi Minh Phuong, Le Nguyen Mai Anh, Thai Doan Thanh, Nguyen Tuan Anh, and Hoang Minh Dong

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Nong Lam University, Ho Chi Minh City, Vietnam
Ho Chi Minh City University of Industry and Trade, Ho Chi Minh City, Vietnam

PII-30 SPECTRAL–SPATIAL CHARACTERIZATION OF CAMOUFLAGED TARGETS IN VISIBLE, RED-EDGE, NEAR-INFRARED AND LONG-WAVE INFRARED BANDS

Do Xuan Doanh, Vu Chi Thanh, Dao Hong Hai, Pham Son Lam, Do Ngoc Lam
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Posts and Telecommunications Institute of Technology, 96A, Tran Phu, Ha Dong, Hanoi

PII-31 PHYSICS-GUIDED FOG-STABLE BAND SELECTION FOR CPU-EFFICIENT HYPERSPECTRAL ANOMALY DETECTION

Do Xuan Doanh, Vu Chi Thanh, Dao Hong Hai, Pham Son Lam, Do Ngoc Lam
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Posts and Telecommunications Institute of Technology, 96A, Tran Phu, Ha Dong, Hanoi

PII-32 COMPARATIVE EVALUATION OF THERMAL CAMOUFLAGE CLOTHING USING SR-5000N SPECTRAL RADIOMETRY AND FIELD THERMAL IMAGING

Nguyen Thanh Lam
Institute of Defence Equipment, Academy of Military Science and Technology, 17 Hoang Sam, Nghia Do, Ha Noi, 11353, Viet Nam

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Nguyen Truong Tho, Nguyen Quoc Tuan, Le Vu Truong Son, Dinh Thanh Khan, Dang Ngoc Toan, Vinh Tien Nguyen
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Ho Chi Minh City University of Technology and Engineering, Hochiminh, Vietnam
University of Science and Education – The University of Danang, Danang, Vietnam
Duy Tan University, Danang, Vietnam

PII-34 DESIGN AND NONLINEAR PROPERTIES OF $Ge_{20}Se_{70}Te_{10}$-BASED OCTAGONAL PHOTONIC CRYSTAL FIBERS

Nguyen Thanh Thao, Hoang Thi Thu Giang, Tran Thi Phuong Uyen, Nguyen Tuan Anh, Hoang Trong Duc, Nguyen Thi Thuy, Vo Khanh Vy
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PII-35 FABRICATION AND STUDY OF OPTICAL PROPERTIES OF $CoAl_2O_4$ NANOCRYSTALS CO-DOPED WITH Tb^{3+} AND Eu^{3+} IONS

Nguyen Trung Kien, Vu Dinh Lam, Nguyen Thi Hien, Nguyen Xuan Ca
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Vietnam National Space Center, Vietnam Academy of Science and Technology

PII-36 EFFECT OF GRAPHENE QUANTUM DOT SIZE ON THE PHOTOVOLTAIC PERFORMANCE OF SINW/PEDOT:PSS HYBRID SOLAR CELLS

Do Tuan, Pham Van Trinh, Nguyen Van Chuc, Cao Thi Thanh, Pham Van Nhat, Nguyen Van Hao, Pham The Tan, Nguyen Van Tu, Phan Ngoc Minh
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Graduate University of Science and Technology, VAST, Hanoi, Vietnam
Thai Nguyen University of Sciences, Thai Nguyen, Vietnam
Hung Yen University of Technology and Education, Hung Yen, Vietnam

PII-37 DESIGN AND OPTIMIZATION OF A CASSEGRAIN-TYPE INFRARED OPTICAL SYSTEM WITH A MANGIN SECONDARY MIRROR

Bui Dinh Bao, Ha Nguyen Binh, Phan Nguyen Nhue, Duong Chi Dung, Hoang Van Phong, Tong Minh Hoa
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PII-38 DESIGN AND OPTIMIZATION OF A COMPACT INFRARED CATADIOPTRIC SYSTEM WITH A MANGIN PRIMARY MIRROR

Bui Dinh Bao, Ha Nguyen Binh, Phan Nguyen Nhue, Duong Chi Dung, Hoang Van Phong, Tong Minh Hoa
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PII-39 COMPARATIVE ASSESSMENT OF VIETNAMESE AND INTERNATIONAL MILITARY CAMOUFLAGE PATTERNS BASED ON THE CIELAB COLOR SIMILARITY INDEX

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Department of Optical Instruments, Le Quy Don Technical University, 236 Hoang Quoc Viet, Nghia Do, Hanoi

PII-40 PICOSECOND PULSE COMPRESSION AT BACKWARD STIMULATED RAMAN SCATTERING IN WATER

I.A. Khodasevich, A.I. Vodchits, L.E. Batay, S.M. Pershin, Vu Duong, Pham Hong Minh, V.A. Orlovich
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A.M. Prokhorov General Physics Institute of the RAS, 38 Vavilov St., Moscow, Russia
Institute of Physics of the VAST, 10 DaoTan, BaDinh, Hanoi, Vietnam

PII-41 PICOSECOND SRS IN AQUEOUS SOLUTION OF SODIUM NITRATE IN THE VISIBLE AND ULTRAVIOLET SPECTRAL RANGES

A. I. Vodchits, L. E. Batay, I. A. Khodasevich, S. M. Pershin, Vu Duong, Pham Hong Minh, V.A. Orlovich
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Prokhorov General Physics Institute of the RAS, Vavilova Str. 38, Moscow, Russia
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PII-42 DESIGNING A HANDS-ON, MISSION-BASED RESIDENCY FO QUANTUM INNOVATORS IN VIETNAM: CURRICULU ARCHITECTURE AND EVALUATION PLAN

Nguyen Dang Thanh Nhan, Nguyen Luong Quang, Rossy Nguyen
Institute for Astronomy and Space Quantum Communications (IAS), Vietnam
CEA, Paris-Saclay

PII-43 PHASE-SENSITIVE MICROWAVE EIT IN A CLOSED-LOOP Y-TYPE FOUR-LEVEL ATOMIC MEDIUM

Luong Thi Yen Nga, Le Thi Dung, Le Van Doai, Nguyen Huy Bang, Trang Huynh Dang Khoa, and Hoang Minh Dong
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PII-44 STRUCTURAL EVOLUTION OF GRAPHENE-LIKE CARBON/Cu–Ni HYBRID MATERIALS SYNTHESIZED BY SOLUTION COMBUSTION METHOD

Cao Thi Thanh, Tran Dai Lam, Nguyen Van Tu, Pham Van Trinh, Nguyen Thi Huyen, Pham Duy Long, Do Tuan, Nguyen Van Chuc, Dam Nhan Ba, Vu Xuan Hoa, Nguyen Van Hao, Kirill Podbolotov, Le Ha Chi
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Hung Yen University of Technology and Education, Hung Yen, Vietnam
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Physical-Technical Institute of the National Academy of Sciences of Belarus

PII-45 FABRICATION OF PERIODIC STRUCTURES ON LITHIUM NIOBATE BY TWO-BEAM PICOSECOND-LASER INTERFERENCE

Ngo The Vinh, Nguyen Van Thuong
Institute of Defense Equipment, Academy of Military Science and Technology
Hanoi University of Industry

PII-46 EFFECT OF WEATHER CONDITIONS ON UAV TRACKING CAPABILITY OF SCANNING LIDAR SYSTEMS

Ngo The Vinh, Luong Van Cuong
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Hanoi University of Industry

PII-47 DUAL-LIQUID ELLIPTICAL-CORE PHOTONIC CRYSTAL FIBER WITH HIGH BIREFRINGENCE FOR NEAR-INFRARED POLARIZATION-MAINTAINING SUPERCONTINUUM GENERATION

Ngoc Thi Minh Vo, Ha Le Ngan Trinh, Thanh Vo Nhat Nguyen, Hoang Nguyen Tuan, Tham Hong Tran, Hue Thi Nguyen, Hieu Van Le, Lanh Chu Van
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PII-48 DEVELOPMENT OF SINGLE PHOTON COUNTER BASED ON ACTIVELY QUENCHED AVALANCHE PHOTODIODE

Dinh-V-Trung, Nguyen Thanh Bao, Phung Viet Tiep
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PII-49 THE ANALYZE STRUCTURAL AND OPTICAL PROPERTIES OF Ce^{3+}, Tb^{3+} IONS CO-DOPED STRONTIUM ALUMINATE BOROTELLURITE GLASS

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Thuyloi University, 175 Tay Son, Dong Da, Hanoi, Vietnam

PII-50 CONDENSATION DYNAMICS OF QUANTUM WELL EXCITON-POLARITON UNDER PERPENDICULAR MAGNETIC FIELD

Nguyen Duy Vy
Van Lang University, Ho Chi Minh city, Vietnam

PII-51 LOCALLY COUPLED PARITY–TIME-SYMMETRIC MICRORINGS: RE-ENTRANT PHASE TRANSITIONS AND NONLINEAR PROPAGATION-STABLE STATES

Le Xuan The Tai
Van Lang University, Ho Chi Minh city, Vietnam

PII-52 FABRICATION OF NANOSTRUCTURES ON AN Au/Pd-BASED PLATFORM CAF_2 USING LOW-ENERGY FEMTOSECOND LASER PULSES

Nguyen Thi Huyen Trang, Sergey Ivanovich Kudryashov, Lam Thi Nhung
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SESSION POSTER III

October 02, 2026 (Friday)

13:30 - 17:30

Chairperson:

Prof. Le Thi Ngoc Loan (QuyNhon University, Vietnam)
Dr. Nguyen Thi Thu Hien (HCM Univ. of Industry and Trade, Vietnam)

PIII-01 ELECTRODEPOSITED Cu_2S NANOSPHERES ON ITO FOR NONENZYMATIC ELECTROCHEMICAL CHOLESTEROL SENSING

Tran Trung Tin, Ngo Ngoc Anh Thu, Nguyen Xuan Thanh Tram, Lam Quang Vinh
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Faculty of Physics and Physics Engineering, University of Science, VNUHCM, Ho Chi Minh City, Vietnam
Vietnam National University Ho Chi Minh City, Linh Xuan Ward, Ho Chi Minh City, Vietnam

PIII-02 THE STIMULATED RAMAN SCATTERING OF THE 40 ps Nd:YAG LASER THIRD HARMONIC RADIATION IN THE MIXTURES OF WATER AND ETHANOL

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PIII-23 SYNTHESIS, STRUCTURAL CHARACTERIZATION AND OPTICAL PROPERTIES OF Tb^3-DOPED MgF_2 NANOCRYSTALS

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PIII-34 INVESTIGATION OF THE OXIDASE-LIKE ACTIVITY OF PLATINUM NANOPARTICLES USING TMB AS A CHROMOGENIC SUBSTRATE

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PIII-36 OPTICAL PROPERTIES AND GROWTH KINETICS OF HIGHLY UNIFORM 40 NM GOLD NANOPARTICLES SYNTHESIZED BY GLUCOSE MEDIATED SEEDED GROWTH

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PIII-38 STRUCTURAL PARAMETER OPTIMIZATION OF As_2S_5 CHALCOGENIDE SUSPENDED-CORE FIBERS FOR MID-INFRARED SUPERCONTINUUM GENERATION

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PIII-39 COMPOSITION-DEPENDENT PHOTOCATALYTIC ACTIVITY AND MAGNETIC RECOVERY OF g-C_3N_4/Fe_3O_4 NANOCOMPOSITES

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PIII-42 SYNTHESIS AND PURIFICATION OF HIGHLY LUMINESCENT $CsPbBr_3$ PEROVSKITE NANOCRYSTALS WITH HIGH PHOTOLUMINESCENCE QUANTUM YIELD

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PIII-43 ACHIEVING HIGH PLQY IN $CsPbI_3$ PEROVSKITE QUANTUM DOTS THIN FILMS VIA A DUAL STRATEGY

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PIII-48 NUMERICAL ANALYSIS OF EFFECTIVE MODE AREA AND CONFINEMENT LOSS IN $C_2H_4Br_2$-FILLED As_2S_3 SUSPENDED-CORE PHOTONIC CRYSTAL FIBER

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PIII-50 OPTICAL BANDGAP MODULATION AND ELECTROCHEMICAL KINETICS IN MIXED-PHASE V_2O_5 NANOWIRES

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PIII-51 STUDYING THE PHOTO-, THERMO-LUMINESCENCE PROPERTIES OF TeO_2-B_2O_3-Na_2O-K_2O-Ce_2O_3 GLASSES

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PIII-52 PREPARATION AND INVESTIGATION OF NITROGEN-DOPED GRAPHENE QUANTUM DOTS FOR POTENTIAL APPLICATION IN PHOTOACTIVITY

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ABSTRACTS

PLENARY SESSION

PL-01

TELECOM SINGLE-PHOTON EMITTERS IN SILICON: DETERMINISTIC CREATION AND PHOTONIC ENGINEERING OF QUANTUM LIGHT

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Abstract. Scalable quantum technologies demand single-photon sources that combine telecom-wavelength operation with the manufacturability of a mature industrial platform. Silicon colour centres have recently emerged as a compelling answer to this challenge, uniting bright telecom-band emission with the scalability and CMOS compatibility of silicon photonics. In this keynote, I will present our progress towards mastering the two ingredients essential to a viable quantum photonic technology: deterministic control over where these emitters are created, and full engineering of how they interact with their photonic environment. I will first show how individual G centres can be isolated in commercial silicon-on-insulator, delivering bright, photostable and linearly polarised single-photon emission in the telecom O-band [1]. I will then demonstrate how femtosecond-laser irradiation enables the local, maskless creation of G and W centres directly in silicon-on-insulator [2]: this approach offers spatially selective defect formation, does not necessarily require prior carbon implantation, and, combined with low-temperature annealing, allows G-centre emission to be suppressed while enhancing that of W centres. Finally, I will show how G centres can be embedded in sub-micrometric silicon Mie resonators [3], where matching the emitter distribution to the optical modes through resonator geometry, implantation depth and defect-activation conditions produces strongly directional emission and an estimated collection efficiency of up to 89% into the upper half-space with conventional optics. Together, these results trace a complete route from the deterministic creation of telecom quantum emitters to the engineering of their emission and its efficient extraction in silicon photonic structures. I will close by placing this progress within the broader landscape and the outstanding challenges of integrating colour centres into scalable silicon quantum photonic devices [4].

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PL-02

HALIDE DEFECT PASSIVATION IN PEROVSKITE NANOCRYSTALS BY THE FRIEDEL–CRAFTS REACTION

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Abstract. Perovskite nanocrystals (NCs), particularly $CsPbX_3$ (X = Cl, Br, I), are promising candidates for next-generation optoelectronic devices due to their narrow emission spectra, high photoluminescence quantum yield (PLQY), and tunable optical properties. Despite these advantages, their structural instabilities under moisture, UV light, and high temperatures poses challenges for practical applications. In this study, we investigate the enhancement of the optical properties of $CsPbBr_3$ NCs through post-treatment with an aluminum solution. Although aluminum is not incorporated as a dopant into the $CsPbBr_3$ NCs, the post-treatment effectively induces Br passivation, improving the PLQY without altering other optical parameters, such as PL peak and full width at half maximum FWHM.

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PL-03

DEVELOPMENT OF GaN-BASED VCSELS

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Abstract. Nitride semiconductors are excellent candidates for light-emitting devices in the spectral range from violet to visible. GaN-based blue and green light-emitting diodes (LEDs) have been widely used in lighting and displays. Edge-emitting lasers (EELs) have also been commercialized. Toward development of novel optoelectronic devices, incorporation of microcavity and nanostructures becomes very important and interesting.

In this talk, high quality GaN based Fabry Pérot (FP) microcavity (MC) was prepared and vertical cavity surface emitting lasers (VCSELs) from UVC to yellow-green were demonstrated (Figure 1). For blue VCSELs, coupled QWs were employed and very low threshold current was obtained [1]. For the green VCSELs, by using quantum dots (QDs) as the active layer, the first room-temperature CW lasing was demonstrated [2], and extremely low threshold was obtained by further reducing the cavity length to less than 1 mm [3]. In the UV region, we demonstrated the first VCSEL in UVC (275.9 nm) under optical pumping [4] and the first in UVA (380.1 nm) under electrical pumping [5]. We also fabricated InGaN-based resonant cavity light-emitting diodes (RCLEDs) emitting from violet (376.7 nm) to the red (673 nm) [6,7].

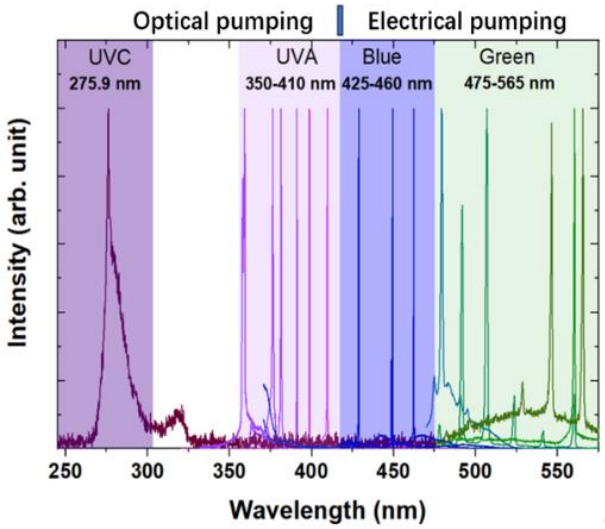

Fig. 1: Summary of lasing spectra of different VCSELs

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PL-04

LASER CRYSTAL APPLICATION WORK WITH ASEAN RESEARCHERS

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Abstract. Light sources in the ultraviolet (UV, □ = 400 nm to 250 nm), deep ultraviolet (DUV, □ = 250 nm to 190 nm) and vacuum ultraviolet (VUV, □ = 190 nm to 100 nm) wavelength regions have numerous technologically important applications, including lithography, sterilization, and surface modification. Solid-state lasers in these short wavelength regions offer the promise of being more robust, easier to maintain, and more cost-efficient light sources compared to conventional excimer lasers, synchrotron radiation, and free electron lasers (FEL). Towards UV, DUV and VUV laser development, we have explored fluoride crystals such as lithium calcium aluminum fluoride (LiCaAlF) and lanthanum fluoride (LaF) as excellent solid-state laser host materials because of their extremely wide band gaps which make them transparent down to about 100 nm. Fluoride crystals have been successfully doped with trivalent rare-earth ions such as cerium (Ce^{3+}) and neodymium (Nd^{3+}), whose dipole-allowed interconfigurational 5d to 4f transitions result in broad fluorescence bandwidths that enable the development of short-pulse tunable solid-state UV lasers. Interconfigurational transitions also result in fast luminescence emission. We leverage these fast emissions to develop fast-response scintillators that detect high-energy radiation. In this talk, I will present our work on rare-earth ion-doped fluoride crystals for solid-state UV, DUV and VUV laser and scintillator development and our work on undoped and impurity-doped ZnO scintillators.

PL-05

QUANTUM PHOTONICS FOR SPACE – APPLICATIONS, CHALLENGES AND SOLUTIONS

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Abstract. Quantum physics is increasingly being applied to real-world problems outside the laboratory, including under harsh environmental conditions and stringent economic constraints.

Quantum computing, for example, shows significant potential for applications in materials science, chemistry, pharmaceuticals, logistics, cryptography, optimization, and even fundamental science. In cryptography, quantum key distribution plays an important role in enabling quantum-secure communication. Quantum sensing of magnetic fields offers new opportunities for exploration, navigation, and medical and biological applications, while electric-field sensing enables ultra-broadband, sub-wavelength, and highly sensitive RF detection. Optical atomic and molecular clocks are an indispensable part of future Global Navigation Satellite Systems (GNSS) and are also required for applications in which RF systems cannot be continuously synchronized but require very high passive relative phase stability.

The industrialization of quantum technologies poses substantial challenges across different domains. First, it requires expertise beyond quantum physics across a wide range of technical and technological fields, including optics in particular electro- and acousto-optics, photonics, material science, mechanics, electronic, specifically ultra-low-noise and ultra-phase-stable RF technologies, and timing-critical software. This unique combination of technical disciplines poses a major challenge for system integration.

Furthermore, some of the required capabilities can only be achieved through novel technological solutions, such as novel materials for photonic integration, e.g. $LiNbO_3$, $LiTaO_3$, and AlN. These materials and technologies are either not yet available as industrial products or are only available with limitations in quality, functionality, or performance. As these solutions are highly specific to quantum technologies, hence their current market size is limited, which in turn impedes the development of a mature industrial supply chain.

Additionally, the technical requirements imposed on subsystems and components by quantum devices regularly push the limits of available technologies and products. This applies, for example, to wafer-level heterointegration of a wide range of different materials, the precision required for the assembly and miniaturization of optical and optoelectronic devices, the availability and quality of optical materials e.g. for the realization of ultra-compact Faraday rotators and ultra-precise machining, to name just a few examples.

To date, these hurdles have prevented quantum technologies from scaling to mass production and reaching broader markets. In fact, however, niche applications can pave the way towards mass-market applications. Quantum technology for space applications plays a specific role in this context: market sizes are small, SWaP (size, weight, and power) and reliability drive technology development, and funding is available to support the necessary development of enabling technologies and components.

In this talk, I will give an overview of our R&D activities towards enabling the operation of quantum sensors in orbit, with a focus on lasers. I will present the current status, highlight specific challenges, and describe how we address them.

PL-06

DEVELOPMENT OF ULTRA-HIGH SPATIAL RESOLUTION GLASS SCINTILLATORS FOR X-RAYS IMAGING APPLICATION

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Abstract. Glass-based scintillators are gaining attention as promising materials for alternative X-ray detection and imaging because of their high optical transparency, compositional flexibility, chemical stability, and cost-effective fabrication. The melt-quenching technique also provides a scalable approach for producing these materials. The performance of these materials has been further enhanced through deliberate modification of their glass compositions. The introduction of rare-earth ions as luminescence centers, together with high-Z constituents to increase X-ray interaction probability, can improve both radiation absorption and the conversion of deposited X-ray energy into visible or near-visible light. As a result, considerable progress has been achieved in applying scintillating glasses to high-resolution imaging platforms, such as synchrotron-based X-ray tomography, micro-computed tomography, biomedical imaging, and industrial non-destructive evaluation.

Nevertheless, several limitations continue to restrict the broader implementation of glass scintillators. In particular, their scintillation efficiency may remain lower than that of some well-established crystalline materials, while structural defects and non-radiative relaxation processes can introduce additional luminescence losses. Addressing these issues requires careful control of the glass network, dopant concentration, local coordination environment, and luminescence centers. This review summarizes recent developments in the design and performance of high-resolution scintillating glasses, with particular emphasis on strategies for improving their X-ray detection capability and image quality. Future research directions toward high-performance glass-based scintillators for advanced X-ray imaging technologies are also discussed.

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SESSION A

A-01

LIGHT MATTER INTERACTION ENHANCEMENT BY POLYMER BASED RESONANT WAVEGUIDE GRATINGS

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Abstract. We investigate theoretically and experimentally optical properties of polymer based grating-coupled waveguides (WRG) and demonstrate their use for enhancing light matter interaction. The polymer-based surface relief gratings were fabricated using either active polymer such as DR1–PMMA or passive polymer such as SU8 by using various techniques such as the two-beam interference or direct laser writing method. The strong local electrical field in the WRG, due to a guided-mode resonance condition, allows to enhance strongly light matter interaction. We show three examples of applications of these polymer based WRGs, namely strong second-harmonic generation, optical modulation of guided mode resonance, as well as guiding the single photon emission direction.

A-02

FEMTOSECOND LASER IONIZATION MASS SPECTROMETRY FOR THE EVALUATION OF FERMENTED RED-YEAST RICE PRODUCTS

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Abstract. Food safety is a worldwide concern. However, many outbreaks of mycotoxicosis have been documented. Recently, a wide variety of dietary supplements are consumed in Japan. These dietary supplements market reached 4.6 billion USD, and in 2023 supplements were used on a daily basis by 30% of the population. Diabetes and obesity are also concerns in modern society, and a dietary supplement is taken to decrease a level of low-density lipoprotein cholesterol. Serious health hazards occurred in Japan to people who ingested a fermented-rice product manufactured using Monascus purpureus to yield lovastatin or equivalents. The manufacturer stated that some unexpected substances were found in the product. The chemicals such as puberulic acid, a compound modified from Monacolin K, and analogue with a similar structure were made public by the ministry of Japan. In the present study, gas chromatography combined with femtosecond laser ionization mass spectrometry (GC-fsLIMS) [1,2] was used to measure contaminated and noncontaminated samples of the supplement in question [3]. Several chemical species were present at concentrations higher than normal levels in the contaminated sample. GC-fsLIMS would be a useful tool for the quality control of commercial products s, which would allow undesirable substances to be identified before shipment to avoid unexpected incidents.

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A-03

MULTIFUNCTIONAL EMBEDDED ALUMINUM MESH IN POROUS ANODIC ALUMINA ON GLASS: ULTRALOW-RESISTANCE TRANSPARENT CONDUCTOR WITH TUNABLE MID-INFRARED RESPONSE

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Abstract. Transparent conductive coatings require a practical balance between high visible transmittance and very low sheet resistance on glass, while exposed metal meshes can be rough and environmentally fragile. Here we review our results of a glass-compatible multifunctional coating in which a square-lattice aluminum mesh is embedded within porous anodic alumina using thin-film deposition of niobium and aluminum, ultraviolet photolithography, and local porous anodization. The embedded metal network achieves a sheet resistance of 1.10 ± 0.05 Ω/□ in the as-anodized state and 1.13 ± 0.05 Ω/□ after annealing (measured at twelve locations), with a visible transmittance at 550 nm of 74.5% after anodization and 77.2% after annealing, corresponding to Haacke figures of merit of 4.79×10^{-2} and 6.65×10^{-2} Ω^{-1}, respectively. In addition to transparent-conductor performance, the periodic lattice produces a tunable mid-infrared response: infrared reflectance measurements show a dip near 19-20 μm with a minimum reflectance of about 0.038 (up to ~53% reduction relative to bare glass), and finite-difference time-domain simulations suggest that lattice period is a primary factor governing the dip wavelength, while the line width and height mainly tune the dip depth and linewidth; because the experimental data reported here were acquired at approximately fixed period, this period dependence should be regarded as simulation-supported. By combining protected, ultralow-resistance current paths with tunable mid-infrared functionality in a single coating,

this work introduces a multifunctional transparent conductive coating on glass with added spectral tunability.

Keywords: Transparent conductive coating, Metal mesh electrode, Porous anodic alumina, Ultralow sheet resistance, Mid-infrared response, Multifunctional coating.

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A-04

TERAHERTZ-PUMP AND X-RAY-PROBE SPECTROSCOPY OF FERROELECTRICS

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Abstract. Strong terahertz electric-field spectroscopy has emerged as a powerful platform for controlling the structure and functionality of quantum materials on ultrafast timescales. Single-cycle terahertz pulses can resonantly drive lattice vibrations and ferroelectric polarizations without significant electronic heating, opening a route toward non-thermal phase control. Capturing such electric-field-induced structural dynamics, however, requires ultrafast probes with atomic-scale sensitivity.

Here, we introduce a terahertz-pump and X-ray-probe experimental platform developed at the SACLA X-ray free-electron laser (XFEL), Japan. Using 10-fs XFEL pulses, we directly track the sub-cycle evolution of ferroelectric polarization and lattice distortion following strong terahertz electric-field excitation. The results establish terahertz-pump and X-ray-diffraction-probe as a powerful approach for exploring and controlling ultrafast structural dynamics in solids.

A-05

GAS PHASE RELAXATION DYNAMICS OF TETRACENE AND PENTACENE

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Abstract. Gas-phase experiments provide the intrinsic properties of molecules, free from environmental influence or with a controlled environment. This allows for the disentanglement of the contributions of the various processes at play: intramolecular processes versus intermolecular processes.

Tetracene (Tc) and pentacene (Pc) molecules exhibit a singlet fission relaxation process when dimers form in the condensed phase [1]. This process is particularly relevant for advancing photovoltaic cells, as it enables the creation of two excited states from the absorption of a single photon by the dimer, thereby increasing the quantum yield.

The study of isolated systems in the gas phase is a crucial step in understanding the relaxation processes in complex systems. In this study, we focus on gas-phase spectroscopy and the ultrafast dynamics of isolated molecules using a pump-probe setup with a femtosecond laser. We present the results obtained for promising candidates for the singlet fission process, such as tetracene and pentacene. Isolated molecules are investigated first, followed by the use of argon clusters to control the stoichiometry of molecular complexes [2].

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A-06

FABRICATION OF MICROSTRUCTURES FOR REFRACTIVE-INDEX CONTROL IN ZINC OXIDE USING ULTRASHORT-PULSE LASER MICROMACHINING

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Abstract. The terahertz (THz) frequency range is promising for next-generation communications and sensing, but reflection loss remains a major challenge [1]. In this study, a one-dimensional moth-eye structure was fabricated on ZnO using ultrashort-pulse laser micromachining to reduce THz reflection, while also introducing artificial optical anisotropy for polarization control.

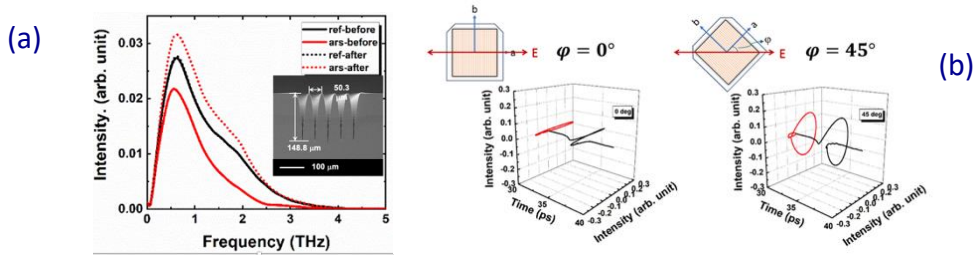

Fig. 1. *(a) THz transmission spectra and cross-sectional SEM image. (b) Transmitted THz polarization trajectories.*

Figure 1(a) shows the THz transmission spectra and a cross-sectional SEM image of the fabricated ZnO moth-eye structure. Laser-induced defects initially reduced THz transmission, while annealing reduced their influence and increased the transmittance above that of unprocessed ZnO, demonstrating the antireflection effect of the moth-eye structure. The one-dimensional grooves also introduce artificial optical anisotropy because polarizations parallel and perpendicular to the grooves experience different effective refractive indices. As shown in Fig. 1(b), when the incident polarization is 45° to the grooves, it is decomposed into TE and TM components, which experience different effective refractive indices. The resulting phase difference converts linear polarization to nearly circular polarization.

These results demonstrate simultaneous THz antireflection and polarization control using a laser-fabricated ZnO moth-eye structure.

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A-07

REVIEW OF EXPERIMENTAL OBSERVATIONS OF GROUP INDEX IN A MULTI-LEVEL Rb ATOMIC MEDIUM UNDER ELECTROMAGNETICALLY INDUCED TRANSPARENCY

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Abstract. Electromagnetically induced transparency (EIT) is a coherent quantum-interference effect that strongly modifies the absorption and dispersion of an atomic medium [1]. The steep dispersion around an EIT resonance can produce a large group index, providing an effective approach for controlling light propagation and realizing slow-light applications [2-4].

Multilevel atomic systems offer additional possibilities for generating multiple EIT windows and controlling the corresponding dispersion and group index [5-8]. However, experimental observation of group index in room-temperature atomic vapor remains challenging because of Doppler broadening and closely spaced hyperfine transitions.

In our recent works, we developed Mach-Zehnder-interferometer-based experimental systems to investigate EIT, dispersion, and group index in Rb atomic media. In a four-level V-type Rb atomic system, three EIT windows and their corresponding dispersion spectra were observed at room temperature, together with giant group index values [9]. We subsequently extended the study to a five-level ladder-type Rb atomic system, where EIT, dispersion, and group index were measured under Doppler broadening, and their dependence on laser power, frequency, and atomic temperature was investigated [10].

In this review, we summarize the main experimental and theoretical results of these two studies, highlighting the observation and control of multi-window EIT, dispersion, and giant group-index responses in multi-level Rb atomic media.

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A-08

ULTRAFAST LASER MICROMACHINING OF THROUGH-DRILL HOLE FOR SEMICONDUCTOR APPLICATION

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Abstract. This paper discusses optical system design strategies for high-throughput CO_2 laser microvia drilling on semicondoctor, with a primary focus on mitigating beam distortion across large scan fields. While conventional UV laser drilling suffers from low throughput, high-power CO_2 laser processing offers significantly higher speeds enabling the ablation of thousands of micrometer-sized via holes per second through copper foil, resin, and glass fiber composites. However, steering the laser beam over large working areas using high-speed galvano mirrors introduces critical optical challenges, such as off-axis field curvature, telecentricity loss, and severe spot distortion (astigmatism and ellipticity) at the field margins, leading to non-uniform hole quality.

To achieve uniform, aberration-free microvia drilling across large field areas, we developed an advanced optical delivery architecture for a continuous roll-to-roll manufacturing system. The core design integrates a high-precision telecentric f-theta lens system, dynamic z-axis focus correction (dynamic focusing optics), and specialized top-hat beam shaping elements. This configuration compensates for angle-dependent wavefront aberrations and maintains a consistent focal spot size and normal incidence angle over the entire scanning area. By preserving an undistorted beam profile and uniform fluence even at extreme galvano deflection angles, the optical system ensures repeatable, high-quality microvia formation at speeds exceeding thousands of holes per second with minimal heat-affected zones (HAZ). Additionally, an inline 3D stereoscopic imaging metrology system is integrated within the process line to monitor hole diameter, roundness, and depth in real time.

A-09

GROWTH AND RADIATION RESPONSE OF Nd-DOPED Lu_2O_3 CRYSTALS FOR A REMOTE DOSIMETRY SYSTEM IN HIGH-DOSE-RATE ENVIRONMENTS

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Abstract. In high-dose-rate environments such as decommissioning of the Fukushima Daiichi Nuclear Power Plant (1F), a real-time remote dosimetry system using a scintillator coupled with a long silica optical fiber has been proposed [1-4]. For remote-dosimetry sys tems using optical fibers, scintillators with near-infrared (NIR) emissions are advantageous because they reduce transmission losses and noise originating from the optical fiber itself, such as Cherenkov radiation and scintillation. Our group has developed near-infrared emitting Nd-doped Lu_2O_3 ($\rho = 9.4$ g/cm³, Zeff = 69, melting point = ~2490°C) which exhibits high gamma-ray attenuation and energy-absorption capabilities owing to the presence of Lu atoms. We evaluated the applicability of the grown Nd:Lu_2O_3 crystal to the remote dosimetry system at high dose rate region.

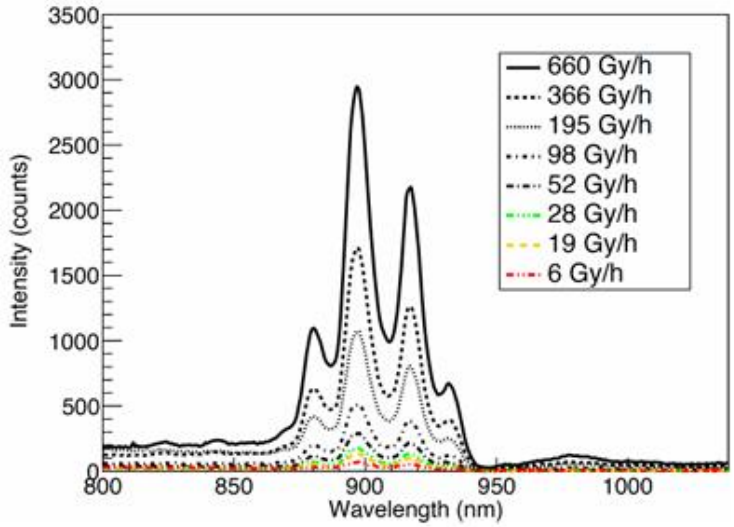

Fig. 1. *Radioluminescence spectra of Nd1%:Lu_2O_3 measured at the dose rates of 6–660 Gy/h using a ^{60}Co source.*

Methods. A single crystal of Lu_2O_3 doped with 1% Nd (Nd1%:Lu_2O_3), with a volume of approximately 2 mm³, was grown using the Core Heating (CH) method [4]. The radiation response of an Nd1%:Lu_2O_3 crystal was measured using an approximately 60 TBq ^{60}Co source

at the Institute for Integrated Radiation and Nuclear Science, Kyoto University (KURNS). The scintillation light was transmitted through an approximately 20 m-long opti cal fiber and measured using a CCD spectrometer.

Results and Discussion. Figure 1 shows the emission spectra of Nd1%:Lu_2O_3 measured at dose rates of 6, 19, 28, 52, 98, 195, 366, and 660 Gy/h. The emission intensity showed a maxi mum at approximately 897 nm, with several characteristic Nd^{3+} emission peaks observed in the 870–940 nm range. The emission intensity increased with increasing dose rate. In addition, the signal-to-noise ratio (SNR) was evaluated, and a good SNR was obtained at approximately 660 Gy/h. These results demonstrate the poten tial of Nd1%:Lu_2O_3 as a scintillator for remote dosimetry in high-dose-rate environments. Fig. 1. Radioluminescence spectra of Nd1%:Lu_2O_3 measured at the dose rates of 6–660 Gy/h using a ^{60}Co source.

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A-10

TEMPERATURE EFFECTS ON SOLAR PV SYSTEM ENERGY GENERATION

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Abstract. The rising costs of electricity have accelerated the adoption of renewable energy systems globally. In a tropical country where there is an abundance of sunlight like the Philippines, solar photovoltaic (PV) systems have become very popular to decrease monthly energy costs. This study looks at how the energy generation of these systems are affected by the hot and humid climate of the country. The primary focus looks at the thermal operating behavior of PV modules and the impact of panel temperature on the overall power output and electrical parameters.

Using standard device equations and available insolation data, the study accounts for variations in the output power and open circuit voltage. The model incorporates a temperature coefficient of -43%/□C for the power and -32%/□C for the open circuit voltage as well as an operating panel temperature of 46□C. Additional data on inclination are also incorporated to quantify the differences at different angles of installation.

The data shows that the gap between expected and actual energy generation is significant. Months that have the highest available sunlight do not necessarily produce the highest amount of energy. The results show the effect on the different considerations in a solar home PV system such as actual energy generation, payback period and system sizing.

Keywords: Solar PV, Temperature effects, Efficiency

A-11

FABRICATION AND CHARACTERIZATION OF Al-DOPED Mg_2Sn FILMS BY RF MAGNETRON SPUTTERING

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Abstract. In the context of modern energy technology, magnesium stannide (Mg_2Sn) compounds are emerging as a group of highly promising thermoelectric materials due to their attractive properties, including a narrow band gap, low density, high melting point, and efficient waste-heat recovery. These characteristics make Mg_2Sn a promising candidate for energy harvesting, cooling, and the fabrication of wearable electronics, portable devices, and low-cost thin-film modules. Recognizing this potential, in recent years, Mg_2Sn materials have been a focus of research in thin-film form to directly serve microelectronic systems and flexible devices. For thin-film applications, enhancing the power factor is often prioritized over reducing thermal conductivity due to the difficulties in measuring thermal conductivity and the significant contribution of the substrate. To realize this, radio-frequency (RF) magnetron sputtering using single alloy targets has been employed to fabricate these films. This approach helps optimize chemical composition and can significantly reduce fabrication costs compared to the complex co-sputtering method. Although pristine Mg_2Sn thin films typically exhibit a lower power factor than bulk materials and demonstrate p-type semiconducting behavior, the combination of thin-film engineering and compositional modification has opened up new directions. Specifically, doping has been demonstrated to be an effective method to enhance thermoelectric performance through controlling carrier concentration and increasing carrier mobility. A representative example is the successful fabrication of aluminum (Al)-doped Mg_2Sn thin films on glass substrates from alloy targets with different Al contents. Microstructural, morphological, and electrical property analyses via methods such as XRD, SEM, XPS, and the Hall effect have shown that Al atoms tend to substitute for Sn sites in the crystal lattice, increasing point-defect density and creating hole-acceptor states. Survey results indicate that controlling the Al content at a moderate level (such as 2 at.%) serves as a key strategy to optimally balance carrier concentration and mobility. Consequently, the material achieves favorable thermoelectric properties, such as a Seebeck coefficient reaching approximately 146–157 μV/K and a relatively high power factor. These results confirm the crucial role of controlling microstructures and doping concentrations, establishing a solid foundation for integrating Al-doped Mg2 Sn thin films into thermal management systems and practical next-generation thermoelectric technologies.

Keywords: Thermoelectric material, Magnesium stannide thin films, Seebeck coefficient, Electrical conductivity.

A-12

SPECTROSCOPIC PROPERTIES OF ANTHOCYANINS IN PURPLE SWEET POTATOES

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Abstract. Anthocyanins are a group of natural compounds responsible for the red, purple, and blue colors of many vegetables and fruits, including purple sweet potatoes (PSP, Ipomoea batatas). In PSP, anthocyanins are mainly acylated derivatives of cyanidin and peonidin, attached to phenolic acids such as caffeic or p-coumaric, which provide antioxidant properties, color stability, and numerous potential health benefits [1]. Research into the spectral properties of PSP anthocyanins has yielded significant results in recent years, focusing on optimizing extraction, characterization of structure, and functional applications [2]. For example, studies from 2020 to 2025 highlighted physicochemical properties determined by UV-Vis and FTIR methods, with ultrasound-assisted anthocyanin extraction techniques yielding higher concentrations and greater stability [3]. Several recent studies addressed isolation and purification via HPLC, revealing a total of 17 major compounds with acylated forms that enhanced thermal and pH stability [4,5]. Bioactivities, such as antioxidant and antidiabetic effects, were linked to UV-Vis spectral shifts at different pH values [1]. However, most previous studies prioritized color indices and metabolomics for content analysis, and there were few discoveries of luminescence kinetics [6].

This report innovates by integrating comprehensive spectroscopic data, including steady-state photoluminescence (PL), time-resolved photoluminescence (TRPL), and excitation-dependent PL, not only to confirm the presence of anthocyanins but also to clarify several luminescence mechanisms, such as intramolecular charge transfer (ICT) and aggregation-induced emission. These mechanisms have not been previously studied in depth for PSPs. Based on pH-dependent dynamics and energy levels (~2.36 eV gap), the report provides fresh insights into photoluminescence stability and potential sensing applications, extending beyond the scope of traditional property evaluation.

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A-13

PHYSICAL MULTI-LAYER MODEL FOR DETERMINISTIC IMAGE RECONSTRUCTION THROUGH HIGHLY SCATTERING MEDIA

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Abstract. We report a physical multi-layer model-based reflectance imaging through complex scattering media. By fitting experimental data to a discrete scattering layer model using optimization frameworks, we successfully reconstruct target images through an intact mouse skull

A-14

CONFOCAL REFLECTANCE ENDOMICROSCOPE THROUGH A FLEXIBLE FIBER BUNDLE VIA ADAPTIVE PHASE CORRECTION

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Abstract. We report a 300-μm-diameter lensless endomicroscope achieving 0.98-μm resolution. By actively compensating fiber aberrations via reflection matrix-based adaptive phase correction, we realized ultrathin, label-free confocal reflectance imaging through a flexible fiber.

A-15

HIGH-EFFICIENCY CERAMIC PHOSPHORS FOR LASER LIGHTING: SUPPRESSION OF PROCESS-INDUCED CARBON CONTAMINATION

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Abstract. Laser lighting has attracted considerable attention as a next-generation light source because of its high brightness, high directionality, and high efficiency. For high-power laser lighting, ceramic phosphors with high thermal stability and efficient heat dissipation are required to suppress performance degradation caused by self-heating.

In this study, we investigate Ce:YAG-Al_2O_3 composite ceramic phosphors, in which the high thermal conductivity of Al_2O_3 is utilized to enhance heat dissipation. Although improved emission characteristics were achieved, samples fabricated by spark plasma sintering (SPS) exhibited noticeable blackening and reduced quantum efficiency. Our investigation revealed that carbon contamination originating from graphite components used in the SPS process causes increased optical absorption and that carbon-related impurities and defects trapped within the highly densified ceramics cannot be sufficiently removed by conventional post-annealing.

To overcome this limitation, we developed an atmosphere-controlled, carbon-free high-speed hot-press system that eliminates graphite components from the sintering environment. Ce:YAG-Al_2O_3 composite ceramics fabricated using this system showed substantially reduced carbon-related defects and markedly improved luminescence intensity compared with samples prepared using conventional graphite molds. These results demonstrate that suppressing impurity incorporation during densification, rather than relying on post-processing, is essential for achieving high-efficiency ceramic phosphors.

The developed processing approach provides a promising route toward low-defect ceramic phosphors for high-power laser lighting. Its extension to nitride-based phosphor materials will also be discussed.

Acknowledgment: We would like to acknowledge the members of SK Medical Electronics Co., Ltd. for their valuable advice on the high-speed hot-pressing method. This work was partially supported by a research grant from the Amada Foundation.

A-16

BIAS VOLTAGE FREQUENCY DEPENDENCE OF THE TERAHERTZ EMISSION SPECTRAL CHARACTERISTICS OF GaAs PHOTOCONDUCTIVE ANTENNA DEVICES

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Abstract. We present our new results on the terahertz (THz) emission intensity and frequency spectral dependence of GaAs photoconductive antenna (PCA) devices on the bias voltage modulation frequency. Three PCA geometries were investigated; namely, dipole, bowtie, and spiral PCA designs. The bias voltage frequency for two waveforms: square (sinusoid) wave bias, was varied over three (four) orders of magnitude. As the entirety of the THz-TDS system is an integration of various excitation, modulation, and data acquisition components having different frequency response contributions, the experimental design was modified to ensure that the individual equipment response did not significantly influence the measured bias frequency modulation characteristics of the THz PCA emitters. In a PCA-PCA emitter-detector TDS system, the lock-in amplifier reference signal was kept at a constant chopping frequency of 2.2 KHz. The bias voltage frequency was then swept from 10 KHz to 100 MHz (sine wave) and 10 KHz to 10 MHz (square wave). With the lock-in amplifier reference set at a much lower frequency than the PCA bias modulation, and the excitation femtosecond laser at a repetition rate that is twice the maximum bias frequency, it was ensured that the frequency dependence of the THz emission intensity, bandwidth, peak frequency, and the SNR were all significantly due to the PCA emitters' response. Initial results show that in general, higher bias modulation frequencies in the MHz range appear to be optimal for PCA emitters in terms of intensity; much higher than the standard bias frequency currently being employed in THz-TDS measurements. Spectral response, however, such as SNR and bandwidth, appear to be relatively frequency independent. The work presents insights that could impact THz PCA devices employed in the design of future high-speed THz spectroscopic and imaging applications.

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A-17

CURRENT STATUS OF ZHAGA STANDARDIZATION OF KOREAN LIGHTING TECHNOLOGY

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Abstract. Zhaga consortium is a de facto standardization organization that promotes engine standardization to ensure the compatibility of LED lighting. Korea Photonics Technology Institute has proposed two standards based on domestic technology. Currently, one has been revised, and the other is being prepared for publication.

This paper aims to introduce the content currently being newly proposed as a Zhaga standard based on Korean technology.

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A-18

PHOTOLUMINESCENCE-BASED BIOSENSING OF URIC ACID AND DOPAMINE USING SEMICONDUCTOR NANOMATERIALS: ZnO, CuO, And g-C_3N_4

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Abstract. In this review, we summarize recent developments in fluorescence biosensors for the detection of UA and DA based on semiconductor materials and their composites, with particular emphasis on the relationship between material properties and sensing performance. Representative systems include ZnO nanostructures, CuO-based composites, and g-C_3N_4/metal oxide heterostructures, in which the interaction between the target analytes and semiconductor surfaces induces changes in photoluminescence intensity through surface adsorption, charge-transfer, or fluorescence quenching mechanisms. As representative examples, a g-C_3N_4/ZnO nanocomposite has demonstrated highly sensitive dopamine detection, achieving a sensitivity of 2.4×10^9 M^{-1} and a detection limit of 5 pM, together with good selectivity in the presence of common serum interferents. For uric acid detection, a highly oriented g-C_3N_4/CuO composite exhibited a sensitivity of approximately 1.222 mM^{-1} over a linear range of 0.1-1.0 mM and a limit of detection of 12 μM and showed a selective response toward UA against common interfering species. These results highlight the potential of semiconductor-based photoluminescence platforms for sensitive and selective biosensing. Finally, the sensing mechanisms, advantages, current limitations, and future perspectives of ZnO-, CuO-, and g-C_3N_4-based fluorescence biosensors are discussed, providing insights into the rational design of high-performance optical biosensing platforms for biomedical and point-of-care applications.

Keywords: Fluorescence biosensor; Semiconductor nanomaterials; Dopamine; Uric acid; ZnO; CuO; g-C_3N_4.

A-19

RECENT ADVANCES IN OXIDE-BASED PHOTOELECTRODES FOR SOLAR WATER SPLITTING: PERSPECTIVES FROM OUR RESEARCH

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Abstract. Solar water splitting using photoelectrochemical (PEC) devices represents a promising strategy for sustainable hydrogen production. Among the various semiconductor materials investigated as photoelectrodes, oxide-based semiconductors have attracted significant attention owing to their excellent stability in aqueous electrolytes, low cost, and relatively facile synthesis. Nevertheless, their PEC performance is often limited by severe charge carrier recombination and poor transport kinetics. Substantial efforts have therefore been devoted to developing high-performance oxide-based photoelectrodes and strategies to overcome these intrinsic limitations. In this presentation, we outline key evaluation metrics for PEC photoelectrodes and highlight recent advances in oxide-based systems developed in our group, specifically focusing on Cu_2O, WO_3, and $BiVO_4$. For each material platform, we analyze intrinsic advantages and bottlenecks, followed by our approaches to enhancing PEC efficiency, including the incorporation of protective layers, cocatalyst integration, and composite architecture design.

A-20

CHIRAL EDGE-STATE SIGNATURES OF BERRY MONOPOLE MERGING AND SPLITTING IN A BILAYER PHOTONIC CRYSTAL SLAB WITH SYNTHETIC MOMENTUM

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Abstract. Berry monopoles are point degeneracies in parameter space where the Berry curvature emanates radially, analogous to magnetic monopoles. Here, we report the adiabatic merging and splitting of Berry monopoles in a bilayer photonic crystal slab combining one genuine and one synthetic momentum. Two monopoles approach, merge, and split within this hybrid parameter space. The process is described by an effective coupled-mode model and confirmed by full-wave simulations. We further propose a scheme to experimentally probe the Berry monopole merging and splitting by monitoring the evolution of chiral edge states localized at the interface between two topological phases with inverted band structures.

A-21

ANALYSIS OF BENZODIAZEPINES BY GAS CHROMATOGRAPHY COUPLED WITH FEMTOSECOND LASER IONIZATION MASS SPECTROMETRY

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Abstract. Benzodiazepine derivatives (BZDs) are being employed worldwide with many of them being marketed and sold internationally. In psychiatric and neurological contexts, alternative drug families with similar effects are currently used for patients of various diseases in order to accomplish anxiolysis and sedation. A variety of approaches have been reported to date for sample preparation procedures and analytical instruments, and these are commonly used for pharmacological, toxicological, and forensic studies. Gas chromatography combined with electron ionization mass spectrometry (GC-EIMS) is the most popular technique for the analysis of drugs and their analogs. However, this technique has a few limitations with respect to small or a lack of molecular ions and background suppression. In this study, we measured a sample mixture of BZDs by gas chromatography coupled with femtosecond laser ionization mass spectrometry (GC-fsLIMS) using the fourth and fifth harmonic emissions (257 and 206 nm) of a Yb laser as the ionization source [1, 2]. As a result, we found that in most cases the mass spectrum consisted of a molecular ion and large fragment ions, which permitted a more reliable identification of the BZDs based on their "fingerprinting" patterns. We proposed possible fragmentation pathways and clarified why the BZDs provided complicated fragment patterns and occasionally no molecular ions in the mass spectrum. The lack of molecular ions was explained by a unique chemical structure with characteristic functional groups that accelerate the dissociation of molecular ions and produce numerous fragments even in fsLIMS.

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A-22

TERAHERTZ EMISSION AND DETECTION FROM LT-GaAs PHOTOCONDUCTIVE ANTENNA WITH AlAs CONFINEMENT LAYER

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Abstract. In this work we utilized molecular beam epitaxy to grow a low temperature grown gallium arsenide (LT-GaAs) with an aluminum arsenide (AlAs) carrier confinement layer deposited at 1μm below the surface and fabricated it into a dipole photoconductive antenna (PCA). We tested the LT-GaAs/AlAs PCA emitter(detector) performance via terahertz (THz) time-domain spectroscopy in which we also investigated the saturation characteristics of the device by performing optical power dependence. Additionally we simulated the THz-PCA emission via Drude-Lorentz model, and the THz-PCA detection via accounting the detector response. For both cases, the carrier lifetime and mobility were the fitting parameters. Results show that the AlAs layer enhanced the THz emission(detection) signal levels and bandwidth and shifted the central frequency towards higher THz frequencies all without significantly affecting the PCA device signal-to-noise ratio. Moreover, results from experiment and simulations suggest that the AlAs layer acts as a carrier confinement layer that confines the THz emission and detection processes in the LT-GaAs layer. Finally, growing an AlAs layer underneath the LT-GaAs layer is a simple and cost-effective technique which can be utilized to design a high bandwidth LT-GaAs-based PCA and a high central frequency with enhanced THz emission(detection) signal levels.

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A-23

EFFECT OF ANNEALING TEMPERATURE ON THE STRUCTURE AND PROPERTIES OF CROSSLINKED PVA/STARCH MEMBRANES WITH g-C_3N_4 NETWORK AND PHOTOCATALYTIC PROPERTY TESTING

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Abstract. The primary objective of this study was to successfully fabricate a nanocomposite based on PVA, starch, glycerol, and citric acid loaded with g-C_3N_4, while systematically investigating the effects of heat treatment on the material's microstructure and macroscopic properties. The study aimed to determine optimal heat treatment conditions to achieve high mechanical strength, minimize swelling, preserve the active g-C_3N_4 phase, and ensure practical applicability in water treatment. Composite films composed of poly(vinyl alcohol) (PVA), starch, and citric acid were prepared via thermal cross-linking; these served as water-stable, recoverable substrates for immobilizing powdered photocatalysts. These optimized substrates were subsequently used to immobilize Ag_3PO_4 and g-C_3N_4 - two representative photocatalysts. Structural, morphological, and optical analyses of the g-C_3N_4-loaded composites revealed that thermal cross-linking primarily modified the polymer matrix while preserving the specific properties of the photocatalytic phase. Pollutant degradation tests demonstrated that both Ag_3PO_4- and g-C_3N_4-loaded composites retained their photocatalytic activity after immobilization. Crucially, these composites could be reused over multiple cycles while maintaining their structural integrity. These results demonstrate that the PVA/starch/citric acid cross-linked matrix offers a simple, low-cost, and eco-friendly platform for converting powdered photocatalysts into reusable systems, thereby improving recoverability during operation and minimizing the risk of secondary pollution from particle release during the treatment of contaminated water.

A-24

pH- AND TEMPERATURE-DEPENDENT CONFORMATIONAL REMODELING OF Amyloid-β42 IN LIPID MEMBRANES: EVIDENCE FROM CIRCULAR DICHROISM, RAMAN SPECTROSCOPY, AND MOLECULAR DYNAMICS SIMULATIONS

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Abstract. Amyloid-β42 (Aβ42) aggregation and its interactions with cellular membranes are strongly influenced by the surrounding physicochemical environment. Among the factors capable of modulating peptide structure and membrane association, pH and temperature are particularly important because they affect peptide protonation, lipid organization, and the balance between different secondary-structure states. This work presents an integrated investigation of the effects of pH and temperature on the conformational behavior of Aβ42 in model lipid membranes composed of dipalmitoylphosphatidylcholine (DPPC). A combination of circular dichroism (CD) spectroscopy, Raman spectroscopy, and molecular dynamics (MD) simulations was employed to characterize changes in peptide secondary structure and peptide–membrane interactions under different environmental conditions. The pH-dependent study revealed pronounced conformational plasticity of membrane-associated Aβ42, with changes in protonation conditions altering the relative contributions of α-helical, β-sheet, and disordered structural components. Molecular simulations provided atomistic insight into the corresponding changes in peptide conformation and its interactions with the lipid environment. Complementary temperature-dependent analysis demonstrated that thermal changes, particularly across the characteristic phase-transition region of DPPC membranes, modify lipid organization and are accompanied by changes in Aβ42 conformational behavior and peptide–bilayer interactions. Together, these results demonstrate that Aβ42 structure in lipid membranes is not static but responds dynamically to both chemical and physical properties of its environment. The combined spectroscopic and computational approach provides a molecular-level framework for understanding how pH- and temperature-dependent membrane properties can regulate amyloid conformational dynamics and potentially influence early events associated with amyloid aggregation at membrane interfaces.

Keywords: Amyloid-β42; DPPC lipid membranes; pH; temperature; conformational changes; circular dichroism; Raman spectroscopy; molecular dynamics simulations.

A-25

SIMULATION AND PARAMETERIZATION OF CHERENKOV-PHASE-MATCHED EO SAMPLING IN $LiNbO_3$ FOR THz DETECTION

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Abstract. Electro-optical (EO) sampling using Cherenkov phase matching in lithium niobate ($LiNbO_3$) offers a powerful route for high-sensitivity terahertz detection. In comparison to conventional crystals used for EO sampling like GaAs, $LiNbO_3$ requires material parameterization to compensate for its high intrinsic absorption and large index mismatch. In this paper, we present a numerical simulation framework that incorporates Cherenkov-angle phase matching, finite probe-beam spatial averaging, and Lorentzian absorption. The model is validated against experimental data, achieving an $R^2 = 0.9609$ fit for the first oscillation. Building on this validated model, we parameterized key physical dimensions probe beam diameter (w_0) and crystal thickness (d) to map out the scaling behaviors that maximize THz signal amplitude. The parameterization results show that decreasing probe beam diameter and increasing crystal thickness up to a saturation point (5500 μm) maximize the detected THz signal.

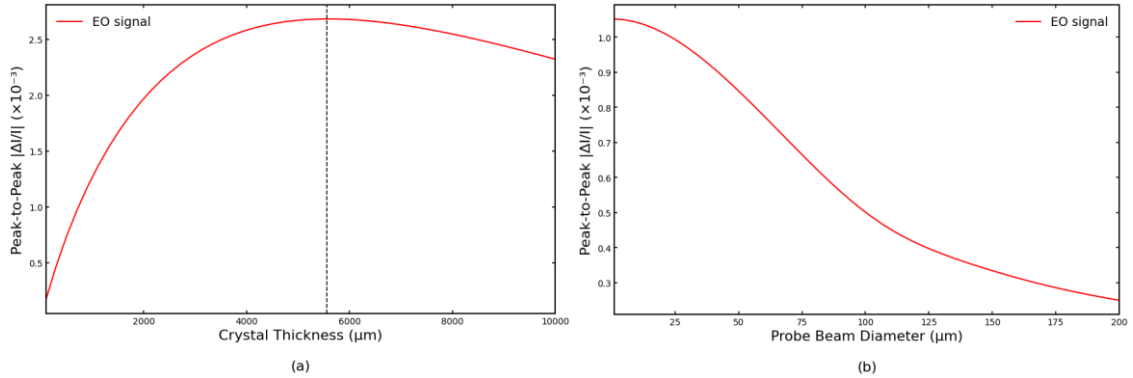

Fig. 1. *a) Parameterization trend of peak-to-peak THz signal vs. crystal thickness (fixed w_0 = 49 μm) and b) Parameterization trend of peak-to-peak THz signal vs. probe beam diameter (fixed w = 5500 μm).*

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A-26

SOLUTION PLASMA-ASSISTED PREPARATION OF STABLE GO–AgNP NANOFLUIDS WITH ENHANCED THERMAL AND PHOTOTHERMAL PERFORMANCE

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Abstract. High-performance photothermal nanofluids are highly promising for enhancing the efficiency of direct absorption solar collectors. In this study, a green and efficient solution plasma-assisted strategy was developed for the in-situ synthesis of silver nanoparticle-decorated graphene oxide (GO-AgNP) nanofluids with enhanced optical and thermal properties. Graphene oxide (GO) was first synthesized using a modified Hummers method and subsequently decorated with silver nanoparticles (AgNPs) through an atmospheric-pressure solution plasma process using a high-purity silver sacrificial electrode. A natural Paramignya trimera extract was employed as a mild stabilizing agent, providing an environmentally friendly route without the use of conventional chemical reducing agents or surfactants. Morphological and structural characterizations revealed the uniform formation of crystalline AgNPs with average particle sizes of 8-12 nm anchored onto the GO sheets. The resulting GO-AgNP nanofluids exhibited excellent colloidal stability, as evidenced by zeta potential values ranging from 26.2 to 38.5 mV. In addition, the incorporation of AgNPs significantly enhanced the optical absorption of the nanofluids over a broad solar spectral range, owing to the combined contribution of the intrinsic absorption of GO and the localized surface plasmon resonance of AgNPs. Compared with pristine GO nanofluids, the GO-Ag nanofluids showed an 8-32% enhancement in thermal conductivity over the temperature range of 30-55 °C. Under AM 1.5 simulated solar irradiation, the GO-AgNP nanofluids achieved photothermal conversion efficiencies ranging from 38 to 69%, demonstrating substantially improved solar-to-thermal energy conversion. The enhanced photothermal performance is attributed to the synergistic plasmonic-graphenic interaction, which promotes solar energy absorption and facilitates heat generation and transport within the hybrid nanostructure. The proposed green plasma-assisted synthesis provides a simple and efficient approach for producing stable, high-performance GO–AgNP nanofluids, highlighting their potential for advanced solar thermal energy harvesting and direct absorption solar collector applications.

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BLADE: BROADBAND LOW-FREQUENCY ASTRONOMICAL DETECTION EXPERIMENT - SYSTEM DESIGN, SITE SURVEY, AND SCIENCE CASE FOR A NEW RADIO TELESCOPE IN VIETNAM

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Abstract. We present the Broadband Low-frequency Astronomical Detection Experiment (BLADE), a new radio telescope project to be deployed in Vietnam with the primary scientific objective of localizing and studying Fast Radio Bursts (FRBs). BLADE is designed to operate over 100–760 MHz and is inspired by the BURSTT instrument deployed in Taiwan [1] and LAMBDA in Australia [2]. We describe the scientific motivation for FRB observations, the results of our radio-frequency interference (RFI) site survey across four locations in the Đắk Lắk and Gia Lai provinces of the Central Highlands of Vietnam, and the design of the Log Periodic Dipole Array (LPDA) antenna optimized for this project. We also describe the front-end module (FEM) receiver chain and the planned back-end signal processing system inherited from the BURSTT project. BLADE's proposed deployment sites are at Quy Nhon Observatory (prototype, 5 m altitude) and Kon Ka Kinh National Park (main outrigger station, up to 1000 m altitude). The instrument is designed to be expandable toward a 16-element in 2026 and 64-element in 2027.

Keywords: Fast Radio Bursts; radio telescope; LPDA antenna; RFI survey; Vietnam; low-frequency radio astronomy; VLBI.

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A-28

INVESTIGATION OF A SAFE HYDROTHERMAL ETCHING PROCESS FOR MXenes ($Ti_3C_2T_x$) SYNTHESIS FROM Ti_3AlC_2 MAX PHASE

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Abstract. We report a hydrothermal strategy for the rapid synthesis of MXenes from MAX phase precursors using an NH_4F/HCl system. Unlike conventional methods based on direct etching with concentrated hydrofluoric acid, which is highly toxic and hazardous, our method uses an NH_4F/HCl system to generate HF in situ**,** thereby reducing the level of toxicity and hazards. Furthermore, unlike conventional approaches that consider etching and intercalation as two sequential steps, our process proceeds through a kinetically coupled "etch-and-prop" mechanism**,** in which the removal of Al layers occurs simultaneously with the in-situ intercalation of ammonium ions (NH_4^+) and water molecules. The intercalated species act as internal spacers, pre-expanding the interlayer galleries, thereby facilitating continued etching while simultaneously suppressing immediate restacking. Investigation of the Ti_3AlC_2 system shows very rapid reaction kinetics: the characteristic (104) diffraction peak of the MAX phase disappears after only 0.5h at the optimized hydrothermal temperature of 150°C**.** However, although the chemical conversion occurs rapidly, the MXenes structure continues to evolve over time, reaching an optimal state in terms of crystallographic ordering and surface area at approximately 6h. At this stage, the BET surface area increases nearly tenfold **(**~11.19m^2/g**)** compared with the pristine material. The dominant BJH pore width **(**~23–24 Å**)** closely corresponds to the c-lattice parameter (~25 Å), indicating that the mesoporosity primarily originates from the expansion of the interlayer galleries. The generality of this hydrothermal strategy is further demonstrated by its successful application to other precursors for MXenes synthesis. Overall, this work establishes a scalable and environmentally benign method for MXenes synthesis, enabling the production of high-quality MXenes.

A-29

SIMULATIONS OF QUANTUM BLOCH-ZENER OSCILLATIONS WITH BINARY WAVEGUIDE ARRAYS

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Abstract. Binary waveguide arrays (BWAs) – a special class of waveguide arrays created by periodically arranging two different types of waveguides are a wonderful photonic system to simulate basic relativistic quantum effects described by the Dirac equation [1] such as electron-positron pair production and annihilation [2], Klein tunneling [3], Dirac solitons [4], Jackiw-Rebbi states [5], and beyond-band discrete solitons [6].

In this talk we present the results of simulations of quantum Bloch-Zener oscillations with the help of BWAs [2]. The behaviors of electrons in crystal lattices under the action of an external linear potential described by the Schrödinger equation were first studied by Bloch [8] and Zener [9]. In 1934 Zener [9] predicted that in this case, one can observe periodic Bloch oscillations (BOs) for electron wave packets. Zener also supposed that BOs cannot last forever but are damped by the interband transition which is called Zener tunneling (ZT). Thanks to ZT, it is possible to realize the electrical breakdown in dielectrics with Zener diodes [9] and tunneling through Josephson junctions [10]. In waveguide arrays one can observe the irreversible decaying of BOs due to ZT to higher-order bands [11]. However, in BWAs, which possess only two minibands, coherent Bloch-Zener oscillations (BZOs) were observed where the ZT showed up as an aperiodic or periodic beam splitting and recombination of light-beam propagation superimposed on BOs [12]. In this talk, we investigate BZOs using an approach based on the evolution of transverse wave numbers of beams in BWAs [7]. We manage to derive simple analytical expressions for the evolution of the central wave numbers of beams in BWAs. This provides a clear and systematic understanding of BZOs and enables us to identify simple analytical expressions for two key distances where the Zener tunneling occurs and where the beam direction changes. We also discuss the combination of BZOs with the Talbot effect in BWAs.

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A-30

ALL-OPTICAL SWITCHING AND ULTRAFAST DEMAGNETIZATION IN $NiCo_2O_4$ THIN FILMS

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Abstract. Since the discovery of subpicosecond demagnetization in Ni in 1996 [1], the microscopic mechanisms governing ultrafast magnetization dynamics have remained under debate. All-optical switching (AOS), in which magnetization is reversed by laser irradiation without an external magnetic field, has attracted considerable attention as a promising approach to next-generation ultrafast magnetic recording. AOS is intrinsically linked to the nonequilibrium state created by ultrafast photoexcitation; therefore, elucidating nonequilibrium magnetization dynamics is essential for understanding its underlying mechanism. In particular, realizing AOS in magnetic materials that do not rely on rare-earth elements or auxiliary heavy-metal layers is of growing importance. Here, we investigate the photoinduced magnetization dynamics of $NiCo_2O_4$ thin films. $NiCo_2O_4$ is an electrically conducting ferrimagnetic spinel oxide that exhibits ferrimagnetic order at room temperature and strong perpendicular magnetic anisotropy, making it a promising platform for ultrafast optical control of magnetization. Our measurements reveal type-II-like ultrafast magnetization dynamics following laser excitation and laser-induced magnetization switching without an applied magnetic field [2–4]. These results demonstrate the potential of $NiCo_2O_4$ as a rare-earth-free material platform for AOS. In this presentation, we discuss the observed type-II-like magnetization dynamics, the characteristics of AOS, and the role of stray fields in AOS in $NiCo_2O_4$ thin films.

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A-31

DECOUPLING LIGHT–MATTER INTERACTIONS: DIELECTRIC METASURFACES FOR SHAPING PEROVSKITE NANOCRYSTAL EMISSION

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Abstract. Engineering photonic environments to control spontaneous emission is fundamental to light-matter interactions and underpins technologies such as LEDs, lasers, and quantum light sources. However, when emitters interact with resonant nanostructures, multiple processes occur simultaneously, making it difficult to isolate and study each mechanism individually [1]. In this talk, I address this challenge using halide perovskite nanocrystals [2] - materials that show great potential for next-generation optoelectronics. Our study demonstrates that dielectric metasurfaces can transform the emission properties of perovskite nanocrystal films, turning isotropic, unpolarized light into directional, polarized output with a tailored spectrum, achieved through coupling to engineered photonic resonances [3,4]. Beyond demonstrating this control, we introduce a quantitative experimental framework that combines with fullwave numerical simulation to decouple the intertwined processes [5]. The talk also briefly summarizes our focused research directions and preliminary results in synthesizing high quantum yield perovskite nanocrystals, high gain-coefficient perovskite quasi-2D materials to perovskite based optoelectronic devices. Initial results of design strategies for topological photonics and inverse design of nanophotonics are presented.

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A-32

EXPLOITATION OF CHERENKOV-PHASE MATCHED OPTICAL RECTIFICATION IN THE SIMULATION AND PARAMETRIZATION OF THz GENERATION IN BULK LN CRYSTALS

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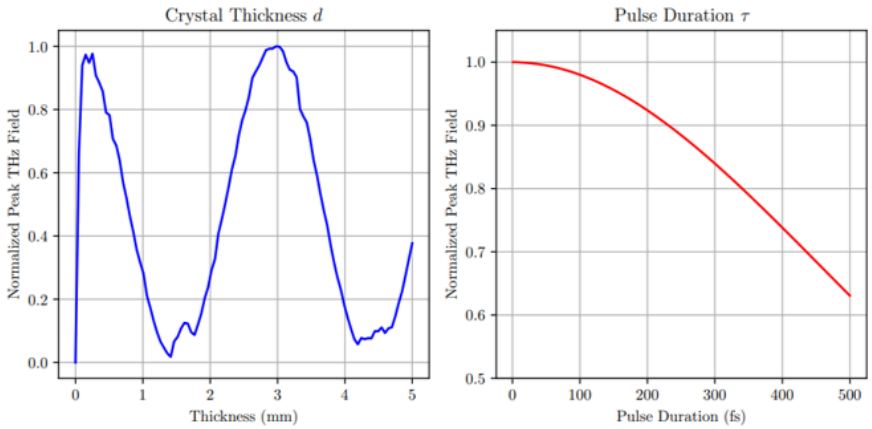
Abstract. The terahertz (THz) gap in the EM spectrum has been of interest to a number of physicists due to its applications in materials characterization, imaging, telecommunications, and many more. THz generation via the optical rectification (OR) is attractive, particularly in bulk lithium niobate (LN) crystals due to its high electro-optic coefficient, which results in ultrafast modulation, low-voltage operation, and low optical losses. However, LN also has a high absorption coefficient in room temperatures which requires Cherenkov-phase matching to guide the generated THz wave for efficient propagation outside the crystal. In this paper, we considered the nonlinear polarization induced by the LN slab in the Maxwell's equations as an ultrashort laser pulse propagates through it as a foundation for the simulation of THz generation with a photoconductive antenna (PCA) detection scheme. Using a Gaussian low-pass filter, we matched the temporal duration of the first oscillation of the experimental data to verify the simulation yielding an $R^2 = 0.9376$. Afterwards, the crystal thickness d and pulse duration τ was parametrized to observe how the peak THz field is affected. We found that it must satisfy the Cherenkov conditions for efficient THz pulse generation, as we observe an oscillatory trend as d thickens due to interference. Furthermore, we found that the detected peak THz field ($I_{detected}$) becomes less efficient with increasing τ. It decayed quite slowly as the pulse width gradually became less impulsive with respect to the detector's natural response.



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A-33

EFFECTS OF HYDROTHERMAL CONDITIONS ON OPTICAL PROPERTIES OF GRAPHENE QUANTUM DOTS DERIVED FROM GLUCOSE/CITRIC ACID/GLUTAMIC ACID

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Abstract. Graphene quantum dots (GQDs) are zero-dimensional carbon nanomaterials with intense optical properties, tunable emission, and excellent biocompatibility **[1]**. In this work, GQDs were synthesized by hydrothermal method using glucose (0.475), citric acid (0.025), and glutamic acid (GluA) at 0.0125–0.0375, at 160–180 °C for 2–6 h. Hydrothermal treatment of small molecular precursors is a well-established bottom-up route for GQD synthesis.

UV-Vis spectra show strong UV absorption and visible transparency. The peak at 250–280 nm corresponds to $\pi \rightarrow \pi^*$ transitions of sp^2 carbons, while the 310–370 nm region relates to $n \rightarrow \pi^*$ transitions from C═O bonds. Increasing temperature from 160 to 170–180 °C enhances the ~280 nm absorption, whereas longer time (6 h) with higher GluA reduces it, suggesting changes in sp^2 domain size and surface states.

PL spectra exhibit broad blue emission at ~448 nm (2.77 eV), FWHM ~146 nm, asymmetric with a tail to 700 nm. The broad PL is attributed to overlapping core (sp^2) and surface/edge state emissions. The blue emission from the sp^2 core can be tuned by modulating sp^3-oxygenous surface states. Proposed mechanisms include quantum confinement, surface traps, giant red-edge effect, and edge state models.

These results demonstrate that hydrothermal conditions and GluA concentration govern the electronic structure and optical properties of GQDs, enabling emission tuning for optical applications.

Keywords: Graphene quantum dots, UV-Vis, photoluminescence, hydrothermal, glutamic acid.

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DESIGN, COMMISSIONING, AND OPTICAL CHARACTERIZATION OF A HIGH-RESOLUTION MODULAR ASTRONOMICAL SPECTROGRAPH AT QUY NHON OBSERVATORY

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Abstract: The development of high-resolution astronomical spectrographs typically incurs prohibitive costs and strict payload limitations for medium-sized telescopes. In this paper, we present the optical design, aberration control methodology, and on-sky commissioning results of a newly developed modular wide-band spectrograph coupled with the 0.6-meter CDK600 telescope at the Quy Nhon Observatory (QNO).

To accommodate the significant physical size disparity between large-format VIS CMOS sensors and compact NIR InGaAs sensors, a modular optical architecture was implemented. For the visible band (350–1000 nm), we adopted a folded Littrow configuration. Initial "First Light" diagnostics revealed severe asymmetrical line broadening (comet-like tails) and a degraded Strehl ratio (S≈0.55), indicative of off-axis Coma aberration. We detail an opto-mechanical correction protocol utilizing a strict *f*/6.5 physical aperture stop and a lever-arm kinematic fold-mirror mount. The Quadratic Convolution Model and Error Function analysis confirmed that intrinsic instrumental blur (δ_{optics}) was successfully minimized.

Quantitative optical testing using a Neon reference source demonstrated that the system achieved an extreme resolving power of R≈20,000 at 6598.9 Å (using a 2400 lines/mm grating and a 15 μm slit). On-sky astrophysical capabilities were subsequently validated through two primary campaigns: (1) the successful measurement of Jupiter's rotational velocity via the Doppler tilt of the H-α (6562.8 Å) absorption line, and (2) the extraction of C2 Swan emission bands from Comet C2025 R3 using a flux-optimized configuration. These results confirm that the QNO spectrograph is a robust, professional-grade instrument ready for time-domain astrophysics and radial velocity measurements.

Keywords: Astronomical spectroscopy, Folded Littrow configuration, Coma aberration, Doppler shift, Resolving power, Quy Nhon Observatory.

A-35

MODERATE-TERAHERTZ-INDUCED PLATEAU EXPANSION OF HIGH-ORDER HARMONIC GENERATION TO SOFT X-RAY REGION

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Abstract. Extending the high-harmonic cutoff with experimentally accessible fields is essential for advancing tabletop coherent extreme-ultraviolet (EUV) and soft X-ray sources. Although terahertz (THz) assistance offers a promising route, cutoff extension at weak, laboratory-accessible THz strengths remains poorly understood. In this report, we investigate THz-assisted high-order harmonic generation (HHG) using time-dependent Schrödinger equation simulations supported by classical analysis. By mapping the plateau evolution versus THz field strength, we demonstrate that even weak THz fields extend the cutoff, producing a pronounced "fish-fin" structure whose dominant branches saturate near Ip + 8Up. We attribute this extension to long electron excursions spanning multiple optical cycles before recombination. Our results establish that this cutoff-extension mechanism is robust across atomic species and driving parameters, indicating that laboratory-scale THz fields enable practical cutoff control and access to high-energy HHG.

A-36

PREDICTIONS OF HIGH TEMPERATURE PRESSURE-BROADENING COEFFICIENTS FOR EXOPLANET ATMOSPHERE STUDIES

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Abstract. Accurate and comprehensive H_2 and He pressure-induced broadening data for CO_2 infrared lines over a wide temperature range are essential for modeling atmospheric opacity of exoplanets. In particular, the strong CO_2 band at 4.3 μm has been clearly identified in the spectra of several exoplanets observed with James Webb Space Telescope (JWST). However, available data are currently limited, some of which are affected by large uncertainties. In this work, H_2 induced pressure-broadening and pressure-shift coefficients were determined at room temperature for the entire □3 band of CO_2 in the 4.3 μm spectral region using the high-resolution Fourier transform infrared spectrometer from the LISA spectroscopy facility. In addition, requantized molecular dynamics simulations of the CO_2-H_2 sand CO_2-He systems were performed using accurate intermolecular potentials. These simulations provide theoretical predictions of He- and H_2-broadening coefficients for CO_2 lines over a temperature range of 200-1000 K and for rotational quantum number up to J=120. The predicted results show very good agreement with the experimental data, with difference of less than 3%, well below the precision required for exoplanet atmosphere studies. This work provides the first accurate and comprehensive dataset of H_2 and He broadening coefficients for CO_2 lines, suitable for modeling of exoplanetary atmospheres [1,2].

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A-37

OPTIMIZING THE COMPOSITION OF STRONTIUM BARIUM ZINC BORATE GLASS DOPED WITH Eu_2O_3 FOR X-RAY IMAGING APPLICATIONS

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Abstract. Strontium barium zinc borate glass doped with varying Eu_2O_3 contents (0 mol% - 6 mol%) was synthesized using the melt-quenching method. For photoluminescence results, the emission spectra displayed five characteristic bands corresponding to $^5D_0 \rightarrow {}^7F_J$ ($J = 0, 1, 2, 3, 4$) transitions under 394 nm excitation. Emission intensity increased with increasing Eu_2O_3 content up to 4 mol% ($4Eu_2O_3$) and then decreased owing to concentration quenching. Under X-ray excitation, the radioluminescence spectra followed the same trend as the photoluminescence emission profile, with intensity peaking at 5 mol% Eu_2O_3 ($5Eu_2O_3$) before quenching at 6 mol%. Thus, optimal $5Eu_2O_3$ glass demonstrated the intense peak area of relative scintillation light exhibiting competitive intensity compared to commercial BGO crystal. Synchrotron X-ray radiography and tomographic microscopy (XTM) at SLRI Beamline 1.2W confirmed that the $5Eu_2O_3$ scintillating glass provides spatial resolution and radiographic contrast, clearly resolving the fine internal structures of electronic components, comparable to reported oxide glass scintillators [1]. These results demonstrate that $5Eu_2O_3$ glass is a promising, cost-effective red-emitting scintillating glass for X-ray imaging.

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A-38

TIME SCALE REALISATIONS USING OPTICAL ATOMIC CLOCKS

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Abstract. Improving the accuracy and stability of national time scales UTC(k) is essential for a wide range of applications such as telecommunication networks, satellite navigation, high-frequency trading, and fundamental scientific research. Optical atomic clocks now surpass microwave frequency standards by more than two orders of magnitude in both accuracy and stability, providing a pathway towards significantly improved time scale generation and supporting international efforts towards a future redefinition of the SI second [1]. In this work, we present the recent development of optically steered time scales at the National Physical Laboratory (NPL) using state-of-the-art optical atomic clocks [2].

Two active hydrogen masers were employed as microwave flywheels, while frequency corrections to the flywheels were derived from NPL's optical clocks through an optical-frequency-comb-based measurement chain. A steering algorithm has been developed to steer the frequency of the masers using the clock data, including a prediction protocol designed to maintain performance during periods of optical clock downtime. Two physical optical time scales were realised during measurement campaigns conducted in 2024 and 2025. Steering was based primarily on data from NPL's Yb^+ ion optical clock which has a systematic uncertainty of $\sim 2\times10^{-18}$ [3]. The performance of the realised time scales was evaluated through comparisons with the UK's national time scale UTC(NPL) and Coordinated Universal Time (UTC). The two optically steered time scales agreed within 200 ps while remaining aligned with UTC at the sub-nanosecond level throughout the measurement periods.

In addition, we are developing a new maser-free optical time-scale architecture in which the microwave flywheel is replaced by an optically derived microwave signal generated from an ultra-stable optical reference via an optical frequency comb [4]. Such signals can achieve a fractional frequency instability below 10^{-16} level at 1 s averaging time, more than three orders of magnitude better than active hydrogen masers [5].

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A-39

OPTICAL AND LUMINESCENCE PERFORMANCE OF RICE HUSK ASH DERIVED SAMARIUM-DOPED BOROSILICATE GLASSES FOR LED ENCAPSULATION

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Abstract: This study examined the effect of Sm^{3+} ion concentration on the properties of a newly developed borosilicate glass system. The prepared glasses were characterized using X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), UV-Vis-NIR absorption spectroscopy, and photoluminescence spectroscopy. The XRD results confirmed the amorphous nature of all glass samples. Furthermore, the density, molar volume and refractive index increased with increasing Sm^{3+} concentration. All doped samples exhibited prominent absorption bands in the UV-Vis-NIR regions, as revealed by the optical absorption spectra. For the photoluminescence study, the emission spectra, under 402 nm excitation wavelength, show emission bands centered at 563, 602, 646, and 706 nm, consistent with characteristic Sm^{3+} transitions. The Judd-Ofelt (J-O) intensity parameters were determined from the absorption spectra to investigate the ligand-field environment surrounding the rare-earth ions [1]. Upon excitation at 402 nm, the photoluminescence (PL) spectra of the prepared glasses exhibited a prominent emission peak at 602 nm. By combining the J-O parameters with the PL spectral data, various radiative parameters were calculated to identify the optimum rare-earth ion concentration. The decay curves were well described by a single-exponential function at low dopant concentrations, whereas a gradual deviation from single-exponential behavior was observed with increasing concentration. The Inokuti-Hirayama (I-H) model was employed to analyze the PL decay profiles and elucidate the energy-transfer mechanism responsible for this transition from single-exponential to non-exponential decay behavior. The results indicate that the energy transfer is predominantly governed by dipole-dipole interactions [2]. The CIE chromaticity analysis revealed that the emission color of the glasses, located in the reddish-orange region under 402 nm excitation [3], is strongly influenced by the Sm^{3+} ion concentration. Considering the photoluminescence emission, stimulated emission cross-section, and CIE chromaticity results, the borosilicate glass is identified as a promising candidate for LED Encapsulation.

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A-40

HIGH-SMSR TUNABLE OPTICAL MODE FILTERING USING AN EDFA AND ODL INTEGRATED VERNIER CAVITY FOR THz-WAVE GENERATION

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Abstract. Terahertz (THz) frequency sources with high frequency stability and low phase noise are increasingly important for next-generation wireless communications and sensing applications. Photomixing of two optical modes extracted from an optical frequency comb (OFC) is a promising approach for generating continuous-wave (CW) THz radiation. To this end, stable extraction of two desired OFC modes is an important requirement. A Vernier cavity is a possible method to increase the effective mode spacing of the OFC [1], thereby facilitating stable single-mode extraction by combining with optical injection locking [2]. In addition, flexible control of the effective mode spacing is desirable because it contributes to tunability of the generated THz frequency.

In this study, we developed a Vernier cavity incorporating an erbium-doped fiber amplifier (EDFA) and a variable optical delay line (ODL). The EDFA compensates for intracavity loss and improves the side-mode suppression of the filtered OFC modes, while the ODL controls the cavity free spectral range (FSR) and thereby tunes the mode-filtering interval. A fiber-based OFC with a repetition frequency of 100 MHz was introduced into the EDFA- and ODL-integrated Vernier cavity. By adjusting the ODL, the mode-filtering interval was tuned from approximately 1 to 5 GHz while maintaining a side-mode suppression ratio exceeding 60 dB. These results demonstrate that the proposed Vernier cavity can enlarge and flexibly control the effective OFC mode spacing while maintaining high side-mode suppression. This configuration is expected to improve the stability of subsequent optical injection locking and provide frequency tunability for CW-THz generation. The proposed approach is promising for realizing a stable, low-phase-noise, and frequency-tunable THz source based on OFC photomixing.

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A-41

BLADE PCB FRONT-END MODULE

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Abstract. Fast Radio Bursts (FRBs) are millisecond-duration radio transients with unknown emission mechanisms and progenitor systems. To detect and localize nearby high-fluence FRBs, the Bustling Universe Radio Survey Telescope in Taiwan (BURSTT) was developed as a wide-field radio interferometer optimized for transient observations (1). BURSTT consists of 256 antennas in main station and from 8 to 64 antennas in out-trigger station, each equipped with a front-end module for radio-frequency (RF) signal conditioning before digital process .The front-end modules (FEMs) of BURSTT are design by assemble each component into 1 box consist of two amplifier, high-pass filter ,bias-tee module which play a role to pre process the sign before get in the FPGA for data acquisition. In VietNam station , the FEMs are designed to minimize the size ,reduce loss and mass production, by integrate each RF component such as pre-amp,driver-amp,low and high-pass filter and bias-tee on a PCB .Using Kicad and CST(student version) for designing and simulating each signal line in the PCB to get a good performance in order to reduce intersecsion loss and signal reflection.

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SESSION B

B-01

PHOTOPHYSICS AND PHOTOREDOX REACTIVITY OF A METAL-FREE TRIAZATRIANGULENIUM PHOTOSENSITIZER

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Abstract. Multielectron photoredox processes are at the heart of solar-fuel production and artificial photosynthesis, yet many efficient molecular photosystems still rely on photosensitizers containing scarce precious metals. Developing robust, metal-free chromophores capable of combining favorable excited-state properties coupled with efficient charge transfer and charge accumulation therefore represents an important challenge. In this contribution, I will present our recent investigations of a triazatriangulenium (TATA+) dye (Fig. 1) as a metal-free photosensitizer for multielectron photoredox catalysis. Following photoexcitation, TATA+ undergoes efficient intersystem crossing to populate a long-lived triplet state with a microsecond lifetime.

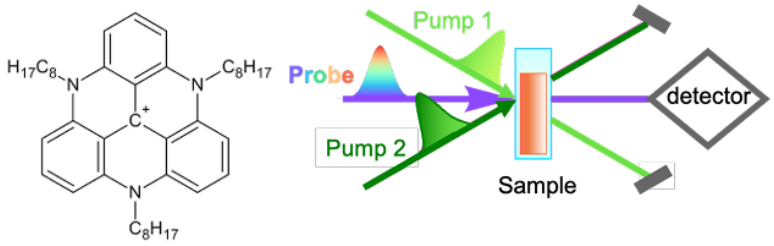

Fig. 1. *Triazatriangulenium (TATA+) dye and pump-pump-probe spectroscopy.*

Remarkably, intermolecular symmetry-breaking charge separation between two excited TATA+ molecules leads to the spontaneous formation of reduced and oxidized radical species. Both singlet and triplet excited states can participate in photoinduced electron-transfer reactions through oxidative and reductive quenching pathways. Reductive quenching generates the persistent neutral TATA radical, providing access to light-driven charge transfer and charge accumulation in various molecular systems. This strategy enables the accumulation of two reducing equivalents on acceptors such as methyl viologen and naphthalene diimide, as observed by pump-pump-probe spectroscopy. Beyond these model systems, TATA+ can be integrated into a biomimetic photocatalytic system for CO_2 reduction using a urea-functionalized iron porphyrin catalyst, reaching catalytic performance comparable to that obtained with the prototypical $[Ru(bpy)3]^{2+}$ photosensitizer under similar conditions. These results highlight the potential of triangulenium dyes as promising metal-free dyes for sustainable photocatalysis.

B-02

RGB-AND MULTI-SPECTRAL SENSORS FOR INTELLIGENT AND ADAPTIVE LIGHTING SOLUTIONS IN BUILDINGS AND GREENHOUSES

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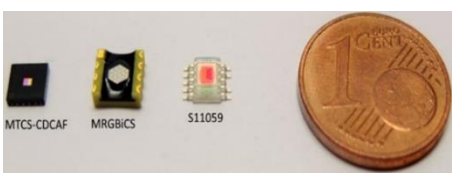
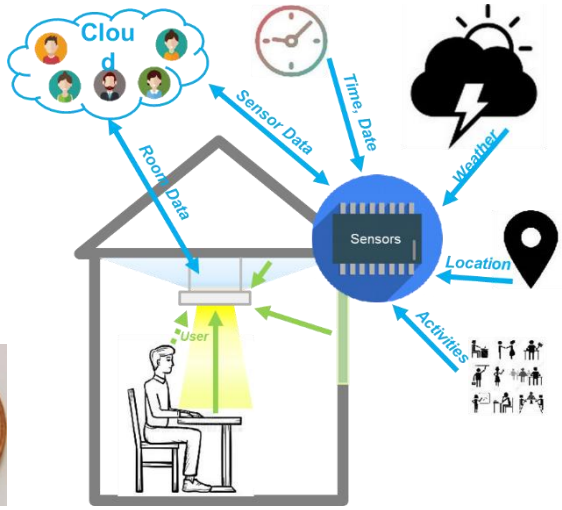
Abstract. For the human well-being, the parameters of interior lighting as spectra, illuminance on the working area, luminance on the walls and its dynamic change over the time of the day are very essential in order to maintain non-visual and visual light perception (see below Figure, right).

In the same manner, plant growth processes in future and current traditional greenhouses are essentially influenced by the light conditions for optimizing the photosynthetic performance, for biomass formation and for the synthesis of secondary substances (chlorophyll, oil concentration, Vitamin etc…).

In each context mentioned above, in order to develop a closed-loop-regulation between LED-lighting systems, humans or plants as light users, and AI-based regulation of lighting conditions, spectral and integral information on the light spectra (absolute and relative parameters) are needed.

In comparison to the optical and photonic measurement in the laboratory rooms with a spectroradiometer, the spectra of the light in the room in a building or in a greenhouse can be determined cost-effectively and relatively accurate with RGB-sensor (RGB-cameras, RGB-photodiodes, see below Figure, left)) and multi-channel spectra sensors with raw signals which are processed with digital signal processing and AI in order to deliver accurate information on the lighting condition. These processes of semiconductor sensor qualification are subject of this presentation.





B-03

EXTREME FIELD GENERATION IN STRUCTURED TARGETS VIA RELATIVISTIC LASER-PLASMA INTERACTIONS

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Abstract. Electric fields approaching the Schwinger Limit and magnetic fields of over 100 kiloteslas have many interesting applications in laboratory astrophysics and high-energy-density physics. However, generating fields of this magnitude in a laboratory is challenging. Typically, generating intense magnetic fields requires an initial seed magnetic field, which further complicates the experimental design. Our research investigates how different target geometries can generate magnetic fields approaching the megatesla regime. We utilize numerical simulations, namely Particle-in-Cell (PIC) simulations, to model the dynamics of the interaction between the different target geometries and ultra-relativistic lasers. Our simulation results show that generating megatesla magnetic fields is possible even without a seed magnetic field. Furthermore, the target geometry can be tailored to generate a magnetic field profile with two strongly opposing magnetic fields, which could have applications in phenomena such as magnetic reconnection. By showing that tailored target geometries can generate megatesla-level magnetic fields without seed fields, this research establishes a potential pathway to replicate extreme cosmic environments in laboratory astrophysics. Furthermore, generating strongly opposing magnetic profiles opens new avenues for studying magnetic reconnection and high-energy-density plasma dynamics.

Keywords: Laser-plasma interactions, Laboratory astrophysics, Magnetic reconnection, High-energy-density plasmas, Particle-in-cell method.

B-04

PROBING ELECTRONIC STRUCTURE, LOCAL COORDINATION, AND DYNAMIC RECONSTRUCTION IN FUNCTIONAL MATERIALS BY MULTI-EDGE X-RAY ABSORPTION SPECTROSCOPY

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Abstract. X-ray absorption spectroscopy (XAS) is an element-specific technique that provides unique information on oxidation states, unoccupied electronic states, local coordination environments, and structural disorder in functional materials. Unlike diffraction-based methods, which mainly probe long-range crystalline order, X-ray absorption near-edge structure (XANES) and extended X-ray absorption fine structure (EXAFS) analyses can characterize both crystalline and locally disordered structures, making XAS particularly valuable for studying defect-rich and dynamically reconstructed catalysts. This presentation summarizes our recent applications of multi-edge XAS to copper-based materials for electrochemical CO_2 reduction. In Cu_2O/CuO-derived electrodes, the complementary use of bulk-sensitive Cu K-edge XAS and surface-sensitive Cu L-edge and O K-edge XAS reveals the evolution of $Cu^0/Cu^+/Cu^{2+}$ states, Cu–O and Cu–Cu coordination, orbital hybridization, and local disorder. The results also demonstrate the importance of considering probing depth when interpreting XAS data from oxide films supported on metallic substrates. For covellite CuS precatalysts, Cu K-edge XANES and EXAFS identify mixed Cu valence states, local symmetry breaking, Cu–S coordination, and synthesis-dependent structural disorder. Comparative measurements before and after CO_2 electroreduction show partial Cu reduction, decreased Cu–S coordination, increased bond disorder, and retention of a sulfide-derived local framework. Complementary S K-edge XANES further reveals S–S bond cleavage and partial sulfur depletion, supporting a non-uniform reconstruction into a Cu-rich, sulfur-deficient catalytic structure. These case studies demonstrate that combining hard and soft XAS, multiple absorption edges, reference compounds, and complementary techniques such as XRD, Raman spectroscopy, positron annihilation spectroscopy, and theoretical calculations provides a powerful framework for establishing relationships among electronic structure, local defects, dynamic reconstruction, and catalytic performance.

B-05

SIZE-SELECTED VO_2 NANOPARTICLES ENABLING TUNABLE PLASMONIC AND THERMOCHROMIC BEHAVIOR FOR SMART GLAZING

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Abstract. Bulk vanadium dioxide (VO_2) is a benchmark thermochromic material that undergoes a reversible semiconductor-to-metal transition (SMT) near 68 °C, accompanied by abrupt changes in electrical and optical properties. Although promising for smart glazing, conventional VO_2 thin films suffer from low solar modulation efficiency (ΔT_{sol}) and limited spectral selectivity. Here, we introduce a strategy to overcome these limitations. VO_2 nanoparticle (NP) films consisting of phase-pure crystalline monoclinic VO_2(M) NPs were synthesized via hydrothermal processing, post-annealing, and polyvinylpyrrolidone-assisted differential centrifugation. This approach enables a precise NP size selection, yielding narrow distributions with modal diameters ranging from 88 to 182 nm. Spectroscopic measurements confirmed a fully reversible SMT behavior and revealed a pronounced size-dependent blue shift of the localized surface plasmon resonance (LSPR), shifting from 1600 nm for the largest to 1140 nm for the smallest NPs, accompanied by an extension of the spectral switching window toward the visible–near infrared boundary. Correspondingly, the normalized ΔT_{sol} increased from 4.2 to 20.7% with decreasing particle size. These results highlight the reproducibility of this synthesis route to synthesized VO_2 NPs with tailored size and crystal structure, featuring enhanced plasmonic response and improved solar modulation. Beyond practical relevance for high-performance smart glazing, this work deepens fundamental insights into the size-property relationship in thermoplasmonic VO_2 systems.

Keywords: *LSPR; solar modulation; smart glazing; thermochromism; VO_2 nanoparticles.*

B-06

THE LASER-INDUCED DAMAGE OF A CMOS IMAGE SENSOR

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Abstract. This study presents an experimental investigation of single-pulse laser-induced damage to individual pixels of an OV7670 CMOS image sensor under irradiation by a 532 nm laser with a pulse duration of 12 ns. The laser beam was focused to a spot smaller than a single pixel, enabling selective irradiation of individual red, blue, and green pixels. The resulting damage morphology was characterized using optical microscopy and scanning electron microscopy. Damage initiated as hole formation in the color filter layer, with threshold fluences of 1.35, 1.74, and 2.43 J/cm² for the red, blue, and green pixels, respectively. The observed threshold ordering (red < blue < green) reflects differences in the optical absorption of the color filters and supports a dominant photothermal mechanism at damage onset. In contrast, the functional damage thresholds determined from the sensor output images were nearly independent of pixel color, indicating that functional damage is primarily governed by laser interaction with the deeper structural layers of the sensor.

***Keywords**:* CMOS image sensor; laser-induced damage; color filter array; damage threshold; nanosecond laser pulse.

B-07

ULTRASENSITIVE OPTICAL DETECTION OF DOPAMINE USING A Nafion/UiO-66-NH_2/ZnO HYBRID MEMBRANE COUPLED WITH THE FOX2 ASSAY

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Abstract. The development of highly sensitive and selective platforms for the detection of trace dopamine (DA) is of great importance for biomedical and point-of-care applications. In this work, we present a hybrid optical sensing platform based on a Nafion/UiO-66-NH_2/ZnO membrane integrated on a glass substrate and coupled with the FOX2 assay for ultrasensitive dopamine detection. The hybrid membrane combines the selective ion-exchange properties of Nafion, the high surface area and functional amino groups of UiO-66-NH_2, and the favorable surface and optical properties of ZnO, providing an efficient interface for dopamine interaction and signal generation. The FOX2 assay was employed to transduce the dopamine-induced oxidative process into a measurable optical response through hydrogen peroxide detection. The resulting sensing platform exhibited a highly sensitive response toward dopamine over an ultralow concentration range of 1-10 pM, with a sensitivity of 0.089 pM^{-1} and a detection limit of 0.637 pM. The excellent response in the picomolar regime demonstrates the synergistic contribution of the hybrid membrane architecture and FOX2-based optical signal amplification. The proposed Nafion/UiO-66-NH_2/ZnO/glass platform provides a facile and highly sensitive approach for dopamine detection at ultratrace concentrations and shows promising potential for optical biosensing applications.

Keywords: Dopamine; Optical biosensing; FOX2 assay; UiO-66-NH_2; ZnO; Picomolar detection.

B-08

QUANTUM COMMUNICATION IN THAILAND

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Abstract. Quantum communication represents a significant real-world application arising from quantum information technology. Thailand is one of the Southeast Asian nations that has recently commenced progress in this domain through scientific research and practical implementation. In this presentation, I will highlight the current status of quantum communication research initiatives in Thailand, along with several fundamental photonic technologies and experimental advancements achieved by our research teams thus far. Furthermore, in light of the forthcoming release of NIST's Post-Quantum Cryptography (PQC) standards in 2024, I will examine Thailand's present response and strategic direction concerning quantum-safe communication technologies and cybersecurity readiness.

B-09

SINTERING TEMPERATURE AND Eu^{3+}/Bi^{3+} DOPING EFFECTS ON THE STRUCTURAL AND PHOTOLUMINESCENCE PROPERTIES OF CaY2O4 PHOSPHORS

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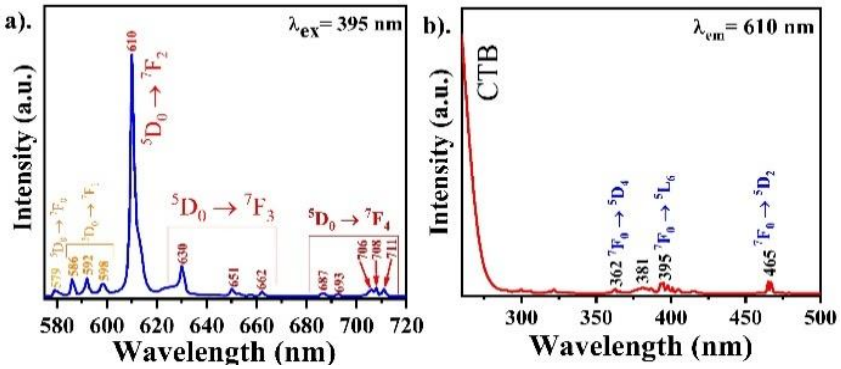
Abstract. In this study, Eu^{3+}-doped and Eu^{3+}/Bi^{3+}-codoped CaY_2O_4 phosphors were synthesized via a solid-state reaction method across sintering temperatures from 1000 to 1300 °C. We systematically characterized the structural, microstructural, compositional, and photoluminescence properties using XRD, SEM, EDX, XPS, FTIR, Raman, PL, and PLE. The synthesized materials phase-crystallized into an orthorhombic structure with the Cmcm space group (No. 63), exhibiting optimal crystallinity at 1200 °C. Elevating the sintering temperature from 1000 to 1200 °C promoted grain growth from 100 to 800 nm, whereas severe agglomeration occurred at 1300 °C. Conversely, increasing the Eu^{3+} concentration from 2 to 6 mol% led to a reduction in average crystallite size from 49.53 to 37.00 nm. Optical measurements demonstrated strong UV and near-UV absorption, yielding intense red emission corresponding to Eu^{3+} intra-4f transitions ($^5D_0 \rightarrow {}^7F_J$). Concentration quenching was identified at 5 mol% Eu^{3+}. Notably, Bi^{3+} codoping substantially enhanced the red luminescence of CaY_2O_4:5% Eu^{3+}, which is attributed to Bi^{3+} acting as an effective sensitizer that increases host absorption, alters the local crystal field, and facilitates efficient energy transfer to Eu^{3+}. These findings highlight the potential of CaY_2O_4:Eu^{3+}, Bi^{3+} phosphors for color display applications and as red-emitting components in white LEDs.

Keywords: Eu^{3+}/Bi^{3+}-codoped CaY_2O_4, CaY_2O_4:Bi^{3+}, CaY_2O_4:Eu^{3+} phosphors, Judd-Ofelt Parameters, Photoluminescence Properties, Cmcm space group, red-emitting.



Photoluminescence spectra excited at 395 nm (figure a) and photoluminescence excitation spectra corresponding to the emission peak at 610 nm (figure b) of the 5% Eu^{3+}-doped CaY_2O_4 sample, calcined at 1200 °C and measured at room temperature.

B-10

OPTICAL CHARACTERIZATION AND APPLICATIONS OF COMPOUND SEMICONDUCTORS

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Abstract. The omnidirectional photoluminescence (ODPL) spectroscopy was developed to determine internal quantum efficiency (QE) for the near-band-edge emissions of semiconductor single crystals with direct bandgap. By employing the property that the emission with photon energies above the absorption-edge energy is strongly emitted in the normal direction to the crystal surface, internal QE can be determined from external QE without model calculations. We proposed the principle of this method in 2016 [1]. The ODPL spectroscopy has been applied to several semiconductor crystals, and its practical use is gaining ground. Particularly in GaN crystals, it is expected to be capable of quantifying extremely low concentrations of carbon impurities. The presentation will provide a detailed explanation of the ODPL spectroscopy, including its principles and application examples. Under conditions where the QE value is extremely high and non-radiative processes can be neglected, the difference between the excitation energy (E_{ex}) and the emission energy (E_{em}) becomes the primary cause of heat generation (Stokes loss). In certain materials, luminescence occurs even when $E_{ex} < E_{em}$, known as anti-Stokes emission. In this case, each emitted photon removes E_{em} - E_{ex} from the system (cooling, negative Stokes loss). For example, $CsPbBr_3$, a type of perovskite semiconductors, exhibits significant upconversion luminescence and is a promising material for achieving optical cooling. Nevertheless, research on optical cooling phenomena in solid-state semiconductors likely remains largely confined to theoretical predictions. We have been working to achieve extremely high QE by reducing the cation vacancy concentration in crystals and to scale up crystal size [2]. In the presentation, the progress of this research will also be explained.

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B-11

MODEL-BASED MULTILAYER RECONSTRUCTION FOR LENSLESS FIBER-BUNDLE HOLOGRAPHIC ENDOSCOPY

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Abstract. Fiber-bundle holographic endoscopes are attractive for minimally invasive imaging because of their small diameter, mechanical flexibility, and ability to provide high-resolution images over a wide field of view. We previously introduced a model-based reconstruction method that uses exact angular-spectrum propagation to retrieve the reflectance of a planar target through the fiber bundle, overcoming the working-distance and field-of-view limits of Fresnel-based approaches. Biological samples, however, are rarely confined to a single plane. Light returning from the target also passes through surrounding scattering structures, and a single-layer model cannot capture these depth-dependent contributions. Here, we extend the framework to a multilayer formulation that represents the sample as a stack of complex-valued layers, retrieved jointly with the fiber-bundle transmission maps from a single reflection-matrix measurement. Because the method explicitly models axial propagation, it separates structures at different depths and improves the contrast of the underlying target compared with the single-layer reconstruction. This extension brings fiber-bundle holographic endoscopy closer to label-free volumetric imaging of realistic three-dimensional biological specimens.

B-12

EXTENDING THE LIMITS OF FREQUENCY METROLOGY: HIGH-PRECISION MID-INFRARED ROVIBRATIONAL SPECTROSCOPY OF TRIOXANE

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Abstract. High-accuracy spectroscopic models of large polyatomic molecules remain difficult to establish because of spectral congestion and the challenge of combining broad spectral coverage with metrological accuracy. In this presentation, we report a comprehensive investigation of the ν_5 CO symmetric stretching mode of 1,3,5-trioxane ($(H_2CO)_3$), a twelve-atom polyoxymethylene molecule of interest for astrochemistry, and precision molecular metrology. The study combines broadband high-resolution Fourier-transform infrared (FTIR) spectroscopy with SI-traceable sub-Doppler saturated absorption spectroscopy referenced to ultra-stable frequency standards.

More than 2000 rovibrational transitions were assigned from FTIR spectra recorded at 0.001 cm^{-1} resolution across the 960-1000 cm^{-1} spectral region. These measurements were complemented by 557 sub-Doppler transitions obtained using an OsO_4-stabilised CO_2 laser and a SI-traceability and ultra-stable quantum cascade laser [1-4], achieving linewidths of approximately 400 kHz and frequency uncertainties as low as a few kHz. The ultra-precise laser measurements revealed residual inaccuracies in the FTIR frequency scale. To overcome this limitation, a model-assisted calibration procedure was developed, in which an optimal correction was derived through a global analysis combining FTIR, sub-Doppler, and previously reported millimetre-wave rotational data.

The resulting rovibrational model provides significantly improved ground- and excited-state molecular parameters, including rotational and centrifugal distortion constants up to sextic order. The ν_5 band origin was determined with a relative uncertainty of 3.7×10^{-10}. This work demonstrates the power of combining frequency metrology and broadband spectroscopy to extend ultra-precise measurements to increasingly complex molecules, while providing new reference transitions for mid-infrared frequency calibration and molecular databases. It also demonstrates the potential of the technologies we develop for probing subtle intramolecular coupling mechanisms in complex polyatomic spectra and for testing fundamental physics.

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B-13

EXPERIMENTAL CHARACTERIZATION OF CHROMATIC DISPERSION IN SILICA-BASED PHOTONIC CRYSTAL FIBER USING A MACH–ZEHNDER INTERFEROMETER

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Abstract. We present an experimental technique for characterizing the chromatic dispersion of photonic crystal fibers (PCFs) using a Mach–Zehnder interferometer and a white light supercontinuum source. In this setup, a PCF sample of known length is placed in one arm of the interferometer, while the optical path length of the other arm is adjustable. By varying the optical path-length difference and identifying the corresponding equalization wavelength, we obtain the wavelength dependence of the differential group refractive index, from which the chromatic dispersion of the PCF is derived. A SuperK Compact source (450–2400 nm) provides broadband illumination for interferometric characterization of a fabricated silica-based PCF over the wavelength range of 580–930 nm. To validate our experimental results, we perform numerical simulations using the geometrical parameters of the fabricated fiber, extracted from scanning electron microscopy (SEM) images. The measured dispersion agrees well with the simulated results across the investigated wavelength range, confirming the accuracy and reliability of our measurement technique. This method offers a simple, reliable, and effective approach for experimentally determining the chromatic dispersion of PCFs.

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B-14

PROSPECT FROM MONITORING LIGHTNING STRIKE WITH BURSTT

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Abstract. The Bustling Universe Radio Survey Telescope in Taiwan (BURSTT) is a software-defined radio interferometer optimized for detecting fast, transient radio emissions over an wide field of view of $\approx 10^4deg^2$. While engineered primarily for real-time Fast Radio Burst (FRB) searches in the $300MHz$-$800MHz$ band, BURSTT's high-throughput digitizers and baseband voltage ring buffers make it exceptionally well-suited for terrestrial atmospheric applications. Here, we demonstrate the feasibility of using the BURSTT array to map atmospheric lightning strikes without a priori knowledge of their locations. By bypassing standard dispersion-search filters and utilizing a zero-dispersion ($DM \approx 0$) real-time trigger pipeline, raw complex voltages captured during thunderstorm activity are preserved across the main array. This highlights the dual-use capability of wide-field astronomical radio facilities as ultra-high-resolution lightning mapping systems.

B-15

CONCENTRATION-DEPENDENT ENERGY TRANSFER IN Tb^{3+} AND Dy^{3+} DUAL-ACTIVATED PHOSPHOSILICATE OXYFLUORIDE GLASSES FOR PHOTONIC APPLICATION

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Abstract. Tb^{3+} and Dy^{3+} dual-activated phosphosilicate oxyfluoride glasses were prepared by the melt-quenching method for visible light emitting applications and potential scintillation. Their photoluminescence and X-ray-excited luminescence were systematically investigated as a function of Dy^{3+} concentration. Under excitation at 214 and 377 nm, the glasses exhibited intense green (G) emission at 543 nm from Tb^{3+} together with characteristic blue (B) and yellow (Y) emissions from Dy^{3+} at 487 and 574 nm, respectively [1]. Under 214 nm excitation, the G, B, and Y emissions increased with Dy_2O_3 content up to 0.5 mol%. Under 377 nm excitation, the G and B emissions reached their maximum at 0.1 mol% Dy_2O_3. Whereas The Y emission reached its maximum at 1.0 mol% Dy_2O_3. Further increases in Dy_2O_3 content reduced the emission intensity, possibly due to concentration quenching and energy-transfer processes from Tb^{3+} to Dy^{3+} [2]. The Tb^{3+} lifetime decreased from 2.886 to 1.414 ms under 214 nm excitation and from 2.814 to 1.338 ms under 377 nm excitation. The corresponding energy-transfer efficiencies ranged from 2.11% to 51.00% under 214 nm excitation and from 1.95% to 50.70% under 377 nm excitation. Dexter–Reisfeld analysis revealed dipole–dipole coupling as the dominant multipolar interaction with a fitting coefficient of $R^2 = 0.9996$. Under X-ray excitation at 50 kV and 30 mA, the glass containing 0.50 mol% Dy_2O_3 exhibited the highest relative scintillation light, reaching 98% of that of the BGO reference. These findings demonstrate the potential of Tb^{3+} and Dy^{3+} dual-activated phosphosilicate oxyfluoride glasses as multifunctional materials for visible light emitting applications and potential scintillation.

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B-16

NOISE-AWARE OPTIMIZATION OF QUANTUM COMPUTING SYSTEM

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Abstract. Quantum arithmetic circuits are fundamental building blocks for many quantum algorithms, but implementing them in Noisy Intermediate-Scale Quantum (NISQ) systems remains challenging due to high gate-error rates and decoherence. While relative-phase Toffoli gates offer a low-cost alternative by reducing critical two-qubit gate counts, their input-dependent phase differences can propagate and degrade final output accuracy if applied indiscriminately. To address this trade-off, this invited talk discusses a systematic, noise-aware optimization framework for quantum arithmetic circuits. Under various NISQ noise models, the proposed optimization successfully reduces both quantum cost and circuit depth, leading to a significant reduction in physical error rates and improved arithmetic accuracy compared to conventional designs.

B-17

DEVELOPMENT OF ACHROMATIC NANOSTRUCTURED MICRO-VORTEX PHASE COMPONENTS USING COMMERCIAL GLASSES

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Abstract. We report the design and numerical evaluation of an achromatic nanostructured micro-optical component (AnVPC) capable of producing fundamental optical vortex beams. The proposed element is based on two thermally compatible glass materials, enabling fabrication through the cost-effective modified stack-and-draw technique [1]. The details of the concept of the achromatic vortex phase element were reported in our previous work [2]; however, it was presented with an artificial glass.

In this study, we numerically investigated a free-space achromatic vortex phase element designed with two commercial glasses satisfying all thermal and dispersion conditions toward the element realization. Simulation results demonstrate that the developed AnVPC can generate single-charge vortex beams with 100% mode-conversion efficiency at two representative laser wavelengths, 521 nm and 829 nm. In addition, the proposed optical component effectively compensates for chromatic aberration while maintaining a mode-conversion efficiency above 90% across 490-980 nm.

Like the traditional nVPC, the A-nVPC shares several advantages: it is cost-effective, has flat surfaces that enable all-fiber system development, and maintains optical properties in liquid environments, a feat not achievable with other phase elements such as SPPs or SLMs. Consequently, A-nVPCs are promising for micro-scale applications involving various gas and liquid media, especially in integrated optical information processing and optical tweezers.

So far, development of nanostructured micro-optical components with novel functionalities has been reported, such as an axicon [3], an achromatic lens [4], and a broadband vortex [5], using Effective medium theory and a nanostructurisation technique realized by a mass-manufacturing modified stack-and-draw method. They were all developed using pairs of in-house-made glasses, which were designed and synthesised by the melt-quenching approach at the Łukasiewicz Research Network-Institute of Microelectronics & Photonics, Poland. This confirms the feasibility of our proposed glass for developing achromatic nanostructured gradient-index vortex phase components.

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B-18

MBE GROWTH OF InGaAsSb FOR SWIR PHOTODETECTORS AND MID-INFRARED LEDs

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Abstract. High-quality lattice-matched InGaAsSb epilayers were grown on GaSb substrates by molecular beam epitaxy (MBE) for short-wave infrared (SWIR, 1.7 - 3.0 μm) photodetectors and mid-infrared (mid-IR, 2.1 - 2.3 μm) light-emitting diodes (LEDs) [1, 2]. Structural and optical characterizations confirmed excellent crystalline quality and infrared emission properties. The fabricated photodetectors exhibited strong room-temperature infrared absorption and high photoresponse, demonstrating the potential to reduce the dependence on cryogenic cooling used in conventional infrared detectors. Meanwhile, the InGaAsSb LEDs showed stable mid-IR electroluminescence, highlighting the versatility of the material platform for both infrared detection and emission. These results demonstrate that MBE-grown InGaAsSb is a promising candidate for compact, low-power infrared optoelectronic devices in the SWIR and mid-IR regions.

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B-19

DUAL-WAVELENGTH UPCONVERSION IN RARE-EARTH-DOPED CaF_2 FOR NIR-TO-MIR INFRARED DETECTION

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Abstract. Infrared (IR) detection in the near-infrared (NIR) and mid-infrared (MIR) regions is important for applications including surveillance, food inspection, and environmental monitoring, but conventional IR detectors can be costly and complex. Here, we demonstrate a low-cost approach based on two-wavelength-excited upconversion (UC) [1] in rare-earth-doped CaF_2 crystals, enabling IR signals to be converted into visible or Si-detectable emission for imaging with standard CMOS cameras [2]. In Er^{3+} :CaF_2, a 1510 nm NIR signal was converted into green emission at 540 nm under 800 nm pre-excitation and clear UC luminescence was observed. For MIR detection, 1550 nm excitation produced a 6–8% enhancement of Er^{3+} emission around 970–985 nm in response to 2.8 μm irradiation, providing a wavelength range accessible to Si-based detectors [3]. In addition, Ho^{3+} :CaF_2 demonstrated another wavelength-conversion pathway, with 1442 nm + 1158 nm excitation producing emission near 650 nm, highlighting the tunability of the UC response through appropriate selection of rare-earth ions and energy levels [4]. These results demonstrate that dual-wavelength UC in rare-earth-doped CaF_2 provides a simple, versatile, and potentially cost-effective platform for NIR and MIR imaging using widely available Si-based cameras.

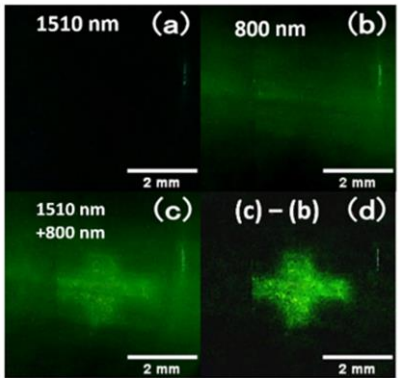

Fig. 1. *Images of the UC luminescence arising from (a) 1510 nm wavelength only, (b) 800 nm wavelength only and (c) 800 nm and 1510 nm wavelengths, (d) after subtracting (b) from (c).*

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B-20

FAST ADAPTIVE OPTICS FLUORESCENCE MICROSCOPY FOR *IN VIVO* HIGH-RESOLUTION IMAGING IN DEPTH

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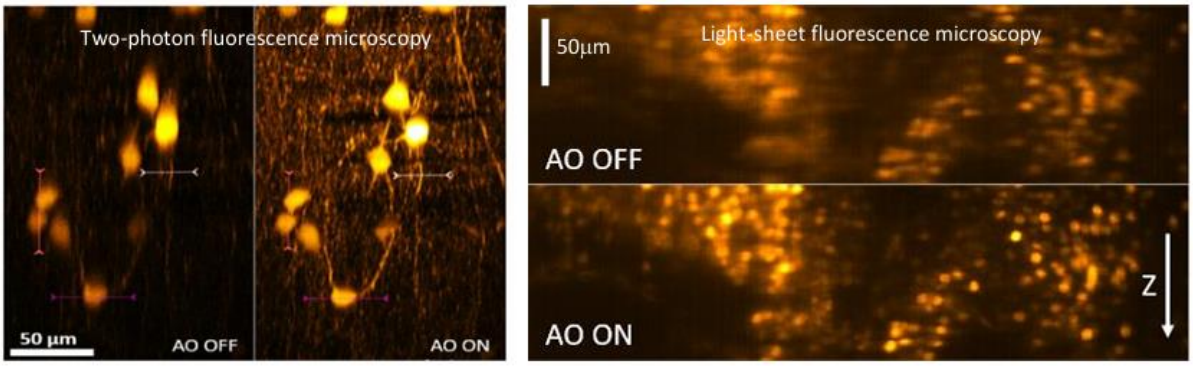
Abstract. The study of fast biological phenomena at the cellular level has become possible even in depth in biological tissues in several animal models and rodents, thanks to efficient 3D microscopy techniques. Light sheet fluorescence microscopy (LSFM) is particularly well suited to imaging relatively transparent specimens such as zebrafish, while 2-photon excited fluorescence microscopy (TPEF) remains the technique of choice for more scattering tissues like mammalian brain. But image quality deep inside biological tissues remains limited by scattering and optical aberrations due to the refractive index inhomogeneity, which limit both resolution and sensitivity in all microscopy modalities. To overcome this difficulty, in particular regarding aberrations, AO has been implemented on several linear and non-linear optical sectioning microscopy setups. When based on direct wavefront sensing, rather than sensorless operation that is slow and limited in dynamic range, it provides a reliable live correction of the aberrations, improving the collected signal and the spatial resolution, and thus enabling functional imaging of synaptic boutons, axons and spines and soma in infragranular layers of the mouse cortex in 2-photon microscopy, or enabling subcellular imaging of organelle dynamics in the early zebrafish brain in light-sheet microscopy.

AO-enhanced TPEF microscopy for biological imaging in depth [1]. Nevertheless, the accuracy of aberration measurement remains challenging at large depths due to the scattering properties of the tissue and thus the low signal to background ratio on the wavefront analyzer camera. By using semiconductor nanocrystals (quantum dots) as bright and stable guide stars when injected into the blood vessels, the source of ballistic fluorescence signal for the wavefront sensor is improved as compared to reported dyes. Furthermore, thanks to their biocompatibility and superior blood circulation time, CuInSe2/ZnS quantum dots emitting at 700nm are ideal guide stars for long-term imaging. Using this approach, we demonstrate that the wavefront can be efficiently and accurately measured deep inside the mouse brain. This enables aberrations to be corrected quickly (typ. 1-4s) and allows to enhance both structural and functional imaging up to 600 μm deep in the visual cortex of genetically labelled, anaesthetized mice.

A novel approach for fast adaptive optics (AO) in light-sheet fluorescence microscopy. A few years ago, we proposed an innovative strategy of adaptive optics for neuroimaging, by adapting pioneer work from astronomy to the constraints of widefield fluorescence microscopy. By using an extended-source Shack-Hartmann wavefront sensor (ESSH), our approach allows to preserve speed and accuracy of the direct wavefront sensing method and takes advantage of existing labelling methods of biological samples [2]. It relies on the cross-correlation of images of an extended source obtained through a microlens array and requires to be coupled to an optical sectioning method in order to provide a guide plane: it is thus interestingly compatible with various fluorescence imaging techniques already implemented for 3D imaging such as

two-photon microscopy or light-sheet fluorescence microscopy [3]. Thanks to ESSH-based AO integration into LSFM microscopy, we performed improved imaging of GCaMP7b labeled neurons in the adult Drosophila brain and provided diffraction limited 3D imaging in vivo in the zebrafish brain, maintaining the ability to distinguish individual cells even at great depths (see figure).



(Left) Two-photon imaging of a fixed mouse brain slice, without and with AO. Images are XZ resliced of a volumetric 150x150x350µm stack. (Right) LSFM images in a live Zebrafish brain, without (top) and with (bottom) AO. Depths: 160 to 300µm.

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B-21

SELLMEIER DISPERSION OF SUCROSE SOLUTIONS FOR REFRACTIVE INDEX MEASUREMENT

Mayuko Koga*[1], Hiroki Nakata[1], Hanayo Takenaka[1], Yugo Akabe[2], Marilou Cadatal-Raduban[2,3], Nobuhiko Sarukura[2], Noriko Chikumoto[2] and Toshihiko Shimizu[2]

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Abstract. We present a simple and non-destructive method for measuring the refractive index and dispersion of transparent materials [1]. Our approach uses a sucrose solution with a known refractive index as an immersion medium. By immersing the sample in the solution and analyzing the disappearance of boundary contrast in CCD-captured images, the refractive index is determined (see Figure). Multiple bandpass filters enable dispersion measurements across different wavelengths. The results demonstrated a precision on the order of 10^{-2}, confirming the feasibility of this proof of concept. Based on these promising results, we further expanded the dispersion measurements of the sucrose solution over a wider range using the dual-prism method [2] to establish a comprehensive database.

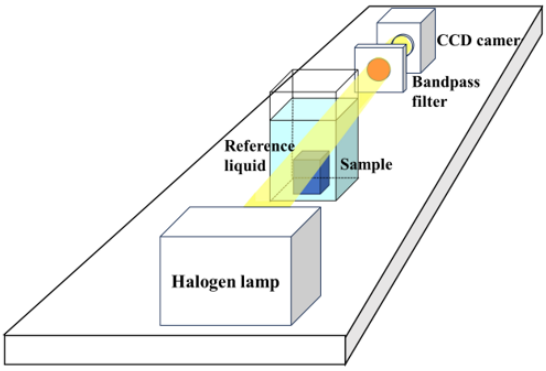

Fig.1. *Experimental setup of non-destructive refractive index measurement.*

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B-22

FROM DEFECT STATES TO HETEROINTERFACES: ENGINEERING OPTICAL RESPONSE IN OXIDE SEMICONDUCTOR NANOSTRUCTURES

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Abstract. Oxide semiconductor nanostructures offer a versatile platform for tuning optical response through the interplay of defect states, phase composition, and nanoscale interfaces. In this invited talk, I will present our recent progress from conventional composition-driven doping toward deliberate defect–interface engineering in ZnO-based and related multiphase oxide systems.

Rare-earth and transition-metal incorporation is first used to illustrate how dopant-induced lattice distortion, oxygen-vacancy-related states, and modified optical transitions can transform structural imperfections into functional electronic states. Multi-element doping further provides a controlled route to adjust defect populations and visible-light absorption while preserving the host oxide framework. Moving beyond isolated defects, artificial ZnAgO/ZnO/ZnAlO composites and Cu_2O/ZnO heterostructures demonstrate how local strain, Fermi-level mismatch, phase coupling, and band alignment can reshape optical response and the environment of photogenerated carriers.

A key result emerges from ZnO/$Zn_{0.4}Ni_{0.6}Fe_2O_4$ nanorod composites, where progressive band-gap narrowing does not translate monotonically into improved functional response. Instead, an intermediate ferrite loading produces pronounced photoluminescence quenching together with a distinct impedance and polarization regime, highlighting interface optimization rather than simple phase addition. We further extend this concept through site-selective Yb and Co incorporation in Cu_2O/ZnO heterostructures, addressing not only which defect should be introduced, but where it should be located relative to the interface. Ongoing work on CuO/$Ba_{0.92}Co_{0.08}TiO_3$/La:ZnO architecture explores the next step toward multi-interface oxide systems with coupled structural, optical, and electrochemical responses.

Photocatalytic measurements are used primarily as functional probes of photon absorption and carrier utilization. Overall, these studies reveal progression from defect-state control to spatially resolved heterointerface engineering, offering design principles for tailoring optical and photoactive responses in complex oxide nanostructures.

B-23

ODD–EVEN HIGH-HARMONIC GENERATION AS A SYMMETRY-RESOLVED PROBE OF INTRINSIC MOLECULAR ASYMMETRY: FROM SPECTRA TO SUB-CYCLE INTERFEROMETRY

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Abstract. Odd–even high-order harmonic generation (HHG) from oriented polar molecules encodes intrinsic molecular asymmetry on the sub-cycle timescale, yet a complete set of amplitude-phase observables connecting spectral measurements to microscopic emission dynamics has remained elusive. In this study, we identify a complete amplitude-phase observable set linking spectral asymmetry, namely odd–even intensity and phase difference, to amplitude and phase asymmetry of consecutive attosecond bursts through an explicit and invertible mapping. We show that these spectral and microscopic quantities provide equivalent signatures of molecular asymmetry within a sub-cycle interferometric picture, revealing parity-resolved electron rescattering cross sections associated with the symmetric and antisymmetric components of the molecular wavefunction. Numerical solutions of the time-dependent Schrödinger equation for oriented CO validate the proposed framework. These results establish odd–even HHG as a unified amplitude–phase probe of molecular asymmetry, enabling quantitative tracking of attosecond asymmetry dynamics directly from spectral measurements.

B-24

SPECTROSCOPY OF ISOLATED COLD DEPROTONATED CHLOROPHYLLS PIGMENTS BY ELECTRON PHOTODETACHMENT

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Abstract. Chlorophyll pigments are essential elements in achieving Photosynthesis through the charge separation processes activated by light absorption. Yet, the electronic spectroscopy of chlorophylls is far from resolved although it is essential to apprehend the detailed mechanisms governing the primary steps of charge separation. We have introduced a new approach to the study of isolated chlorophyll pigments. We study the electronic spectroscopy of their deprotonated anions in a cold environment at 9K. These anions are isoelectronic to the corresponding neutral molecules, therefore their electronic properties are comparable.

The electronic spectrum of the Q bands of deprotonated pheophorbide and methylpheophorbide were observed by resonant two photon electron detachment with 5 cm^{-1} vibrational resolution and show well resolved bands through the visible spectrum very similar in extension with their neutral counterparts in solution. The theoretical analysis is achieved by density functional time dependent density functional (TDDFT) with adapted functionals and Franck Condon calculations.

The comparison of the active orbitals in the Q transitions shows a great similarity between neutral and anionic forms together with some orbital and related level inversions. The vibronic spectra are simulated by Franck-Condon calculations to assign the dominant transitions of the electronic spectrum. Globally, this is a new perspective in the electronic spectroscopy of chlorophyll pigments that has been opened.

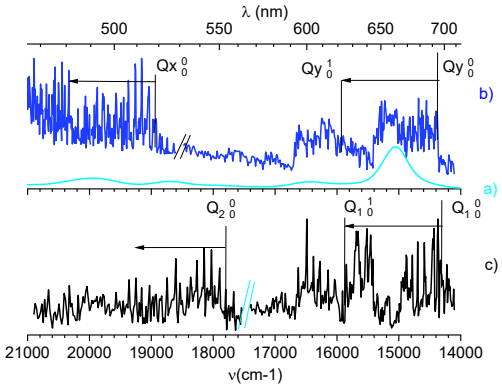

Fig. 1. *Spectra of deprotonated pheophorbide (blue) and methyl pheophorbide (black).*

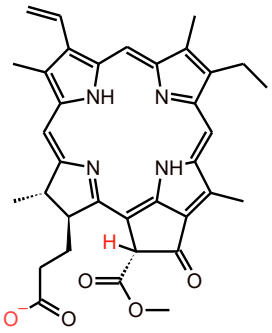

Fig. 2. *Deprotonated pheophorbide.*

B-25

LIGHT YIELD AND SCINTILLATION DECAY TIME OF Ce^{3+} DOPED SILICO-PHOSPHATE GLASS FOR ALPHA DETECTION

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Abstract. This study investigates the fabrication of Ce^{3+} doped silico-phosphate glass scintillators using the melt-quenching technique [1], in order to evaluate their response to alpha radiation. An americium-241 (Am-241) source, which emits alpha particles with an energy of 5.49 MeV, was used for irradiation and the results were compared with a reference glass (SG101). X-ray-induced luminescence (RL) under X-ray excitation was measured using an X-ray-induced luminescence spectrometer and pulse height analysis was performed using a glass sample coupled with a PMT9266B photomultiplier tube and analyzed with a Tukan 8K analyzer [2]. The RL measurements showed that the sample glass exhibited a maximum emission peak at a wavelength of 340 nm. The experimental results showed that the sample glass responded clearly to alpha radiation, producing pulse signals that were distinguishable from the background signal. However, the peak position of the pulse height spectrum was noticeably lower than that of the SG101 reference glass, reflecting a lower light-emission efficiency. The energy resolution of the sample glass was 36.84%, compared to 19.8% for SG101 and its light yield was 49.65% photons/MeV, compared to 1,655 photons/MeV for SG101 [3]. In addition, the decay time of both samples was measured using a FADC analyzer. The results showed that the scintillation decay time of the glass sample exhibited a fast decay component of 22.7 ns (11%), while glass SG101 showed a decay component of 113.4 ns (54.55%). These findings provide important preliminary data for the development of more efficient alpha-radiation scintillator glasses, indicating that further improvement of the composition and fabrication process is required.

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B-26

EXPLORATION OF THE PROPERTIES OF Fe, Ni, Co NANOCOMPOSITE POWDERS SYNTHESIZED BY THE CHEMICAL-METALLURGICAL METHOD WITH VARIABLE NICKEL CONTENT

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Abstract. Nanocomposite powders based on iron-group elements (Fe, Ni, Co) find widespread application in science, engineering, and technology, particularly in the field of magnetic materials. The properties of these nanomaterials depend strongly on their chemical composition, dispersion, and nanoparticle morphology. While elemental nanopowders and binary/ternary nanocomposites of iron-group metals have been extensively studied, the relationships between their composition and properties have not yet been fully elucidated. This study investigates the effect of nickel (Ni) content on the structural characteristics, nanoparticle morphology, and magnetic properties of Fe, Ni, Co nanocomposite powders synthesized by a chemical-metallurgical method. The nanocomposites were prepared from Fe, Ni, and Co nitrate precursors and NaOH solution, with process parameters such as solution concentration and pH carefully controlled to achieve nanoscale dimensions. The resulting Fe, Ni, Co hydroxides were subsequently reduced using hydrogen gas to obtain the final nanocomposite powders. The properties of the obtained powder samples were characterized using X-ray diffraction, low-temperature nitrogen adsorption and scanning electron microscopy. The magnetic properties were measured using a vibrating sample magnetometer (VSM) "LakeShore" 7410.

Keywords: iron group elements (Fe, Ni, Co), nanocomposite, chemical-metallurgical method, magnetic properties.

B-27

ADVANCE OPTICAL FIBER SENSORS BASED ON NANOCOMPOSITES/MULTILAYER MATERIALS FOR SENSITIVE DETECTION OF ENVIRONMENTAL HAZARDS

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Abstract. Advanced optical fiber sensors functionalized with nanocomposite and multilayer materials have emerged as promising platforms for rapid and ultrasensitive detection of environmental hazards. In this work, plasmonic nanocomposites, including Au-, Ag-, Pt-, ZnO-, and metal–organic framework (MOF)-based hybrid materials, are employed to enhance light–matter interactions through localized surface plasmon resonance (LSPR) and evanescent-wave sensing. The synergistic effects of hierarchical nanostructures provide increased active surface area, improved analyte adsorption, and stronger electromagnetic field enhancement, resulting in significantly improved sensing performance. Representative fiber-optic sensors demonstrate ultralow detection limits of 5.16×10^{-12} M for Cu^{2+} and 4.61×10^{-13} M for Cd^{2+}, outperforming many recently reported optical sensing platforms. In addition, nanocomposite-functionalized optical fibers have shown excellent capability for detecting pesticides and antibiotic residues at trace concentrations with rapid response, high stability, and good reproducibility. The integration of multilayer functional coatings with compact fiber-optic platforms further enables portable, real-time, and remote environmental monitoring. These advances demonstrate that nanocomposite and multilayer engineering is an effective strategy for developing next-generation optical fiber sensors with ultrahigh sensitivity and broad applicability in water quality assessment, food safety, and environmental protection.

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B-28

A STUDY OF Er:SiO_2 CLAD ON THIN SI-PADDED Si_3N_4 WAVEGUIDES

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Abstract. In this paper, the study, via simulation, investigates the optical properties of a structure: Si_3N_4 strip waveguides, separated by a SiO_2 substrate, lie under a thin Si layer; above them is Er:SiO_2 cladding, which then be directly pumped to create loss/gain. The Si_3N_4 strip and Si layer, together, form a hybrid mode, at which the mode field is mostly confined in these two [1]. Also, the coupling effect, at which the power is transfered between waveguides, is introduced when at least two waveguides placed close to each other [2]. As the waveguide mode is partly distributed in the Si layer, the structure in this study provides a numerical foundation and solid basis for future experimental fabrication of low-loss integrated circuits and photonic devices.

Keywords: waveguide, coupling, mode.

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B-29

PHYSICS-INFORMED MACHINE LEARNING FOR UNDERSTANDING ELECTRONIC DIELECTRIC RESPONSE IN OXIDE MATERIALS

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Abstract. The electronic dielectric response plays an important role in light–matter interactions and influences the optical and electronic performance of oxide materials. However, understanding this property remains challenging because it is governed by complex relationships among electronic structure, crystal packing, chemical composition, and bonding characteristics. This study applies physics-informed machine learning to predict the electronic dielectric constants of oxide materials and identify the physicochemical descriptors associated with their dielectric behavior. A dataset of 3,304 non-metallic oxides was obtained from the Materials Project database. The materials were represented by 23 electronic, thermodynamic, structural, magnetic, and composition-derived descriptors, together with 10 engineered descriptors based on physically meaningful relationships. Fourteen machine-learning configurations were evaluated, followed by hyperparameter optimization, repeated train–test evaluation, consensus-based feature selection, and SHapley Additive exPlanations (SHAP) analysis. The optimized XGBoost model achieved an R^2 of 0.701, an RMSE of 1.048, and an MAE of 0.610 on an independent test set. A reduced set of 25 descriptors produced nearly equivalent predictive performance. The explainability analysis showed that electronic excitation, structural compactness, atomic-number-weighted content, and electronic-state characteristics jointly contributed to the model predictions. These findings suggest that the electronic dielectric response of oxide materials arises from the combined influence of several physicochemical factors rather than a single dominant property. The proposed approach provides an interpretable framework for studying dielectric behavior and supporting the screening of oxide materials for optical and photonic applications.

Keywords: electronic dielectric response; oxide materials; physics-informed machine learning; explainable machine learning; materials informatics; photonic materials

B-30

GROWTH OF OVER 3-inch β-Ga_2O_3 BULK SINGLE CRYSTALS UNDER PRECIOUS-METAL-CRUCIBLE-FREE CONDITIONS

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Abstract. Compared with conventional wide bandgap materials, such as SiC or GaN, β-Ga_2O_3 is a promising ultrawide-bandgap semiconductor for power electronics because of its wide bandgap (4.5–4.9 eV) and its ability to be grown from the melt. However, conventional bulk melt growth relies on expensive precious-metal crucibles. Technoeconomic modeling identified Ir crucibles as the dominant cost contributor to β-Ga_2O_3 wafer production [1], making crucible-free growth an important route toward lower-cost substrates. A further limitation is the narrow oxygen-partial-pressure window imposed by Ir at high growth temperatures. Near the melting temperature, Ga_2O_3 can decompose through reactions such as

$$2Ga_2O_3(l) \rightleftharpoons 4GaO(g) + O_2(g) \quad \text{and} \quad 2GaO(g) \rightleftharpoons 2Ga(l) + O_2(g).$$

Increasing the oxygen partial pressure shifts these equilibria toward the oxide side and suppresses suboxide/vapor generation. This is important not only for melt stability but also for defect control. Ueda et al. classified three-dimensional defects in β-Ga_2O_3, including micropipes, plate-like nanovoids, and nanometer-sized grooves, and discussed vacancy condensation, bubble incorporation, and local melt-back as possible formation mechanisms [2]. Taishi et al. further proposed that small bubbles in the melt can be incorporated at the growth interface as line-shaped voids elongated along ⟨010⟩ because of the strong growth-rate anisotropy [3]. Together, these reports suggest that high-oxygen-partial-pressure growth, by suppressing oxide decomposition and oxygen-deficient conditions, may help reduce pipe-shaped void defects.

In this study, β-Ga_2O_3 bulk crystals were grown by the oxide crystal growth from cold crucible (OCCC) method, which combines cold-crucible (skull) melting with crystal pulling and eliminates the precious-metal crucible [4,5]. Without Ir, growth at high oxygen partial pressure, including pure O_2, is possible without crucible oxidation. The issue with the OCCC method is that the temperature distribution of the melt is completely different compared to that of using a crucible. Therefore, we began finding for parameters necessary to optimize crystal growth conditions using numerical analysis. Numerical calculations suggested that the temperature distribution changed depending on the height of the coil. It was consistent with the experimental environment. After these considerations, we

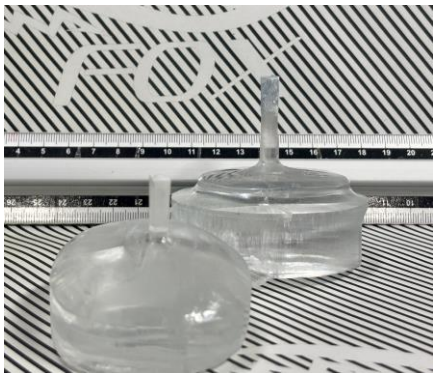

Fig. 1. *Over 3-inch β-Ga_2O_3 crystals grown by the OCCC method.*

were finally able to grow long crystal with diameter control. After optimization of the thermal field and RF heating conditions, stable diameter control was achieved and bulk crystals larger than 3 in. (approximately 80 mm) were grown (Fig. 1). No micropipe-like structures were observed by laser microscopy on the examined OCCC-grown (100) surfaces. OCCC therefore has the potential to address both the Ir-related cost bottleneck and the oxygen-partial-pressure limitation of conventional growth. Systematic measurements of pipe-shaped void density as a function of oxygen partial pressure are needed to establish a direct causal relationship.

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B-31

ASSEMBLY OF SONOCHEMICALLY SYNTHESIZED $Ti_3C_2T_x$ MXene ONTO LASER-INDUCED GRAPHENE FOR FLEXIBLE ENERGY STORAGE AND SENSING APPLICATIONS

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Abstract. Two-dimensional (2D) transition metal carbides (MXenes) and laser-induced graphene (LIG) are premier candidates for next-generation energy storage and electrochemical devices due to their high electrical conductivity, large specific surface area, and rich surface chemistry. Herein, $Ti_3C_2T_x$ MXene was synthesized from Ti_3AlC_2 MAX phase via an ultrasonication-assisted hydrofluoric acid etching method to produce delaminated MXene flakes. A three-dimensional conductive network of LIG was prepared on a flexible substrate using direct laser writing. MXene were subsequently decorated onto the porous LIG framework via electrophoretic deposition to form a robust MXene–LIG (M-LIG) heterostructure. The structural phases, surface morphology, elemental composition, and electrochemical performance of pristine MXene and the M-LIG composite were comprehensively evaluated using X-ray diffraction, scanning electron microscopy, wavelength-dispersive X-ray spectroscopy, cyclic voltammetry. The M-LIG hybrid demonstrates a synergistic structural effect, where the 3D porous LIG matrix facilitates rapid ion diffusion and electron transport while preventing MXene agglomeration. Electrochemical performance demonstrates enhanced pseudocapacitive charge storage, rapid ion diffusion kinetics, and better electrochemical reactivity compared to pristine LIG. This combined synthesis strategy highlights the strong potential of M-LIG composites for high-performance micro-supercapacitors, flexible energy storage devices, and electrochemical sensing platforms.

Keywords: MXene, Laser-Induced Graphene (LIG), Electrophoretic Deposition, flexible energy storage.

B-32

GREENLAND TELESCOPE (GLT): TECHNICAL DEVELOPMENT FOR BLACK HOLE SHADOW IMAGING

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Abstract. The Greenland Telescope (GLT) project is to investigate black holes and their immediate vicinity with imaging the shadows of super massive black holes (SMBHs) using the millimeter/submillimeter. Very Long Baseline Interferometry (mm-/submm-VLBI) technique together with other mm/submm telescopes all over the world. US National Science Foundation (NSF) awarded a 12 m ALMA North America prototype antenna to the group led by the ASIAA and the Smithsonian Astrophysical Observatory (SAO). The telescope was retrofitted for the extreme cold environment of Greenland, and assembled at the US Pituffik Space Base, located at the northwestern region of Greenland. We recently updated the receiver optics, and also developed the holography system for measuring the telescope surface accuracy. In this talk, I will show the recent scientific results and the new development status.

B-33

GREEN-EMITTING Tb^{3+}-DOPED GLASSES FOR DISPLAY DEVICES APPLICATIONS

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Abstract. This research prepared glass samples with the molar composition SiO_2-B_2O_3-Na_2O-CaO-SrO-xTb_2O_3, where x represents the concentration of Tb_2O_3, to investigate their physical, structural, optical and fluorescence properties. The physical properties were evaluated in terms of density and molar volume to examine changes in the glass network structure induced by the incorporation of Tb_2O_3. The structural properties were characterized using X-ray diffraction (XRD) analysis, confirming the amorphous nature of the prepared glass samples. The optical properties were investigated through refractive index and absorption measurements [1]. The glasses exhibited a strong green emission centered at around 545 nm, corresponding to the $^5D_4$ □ $^7F_5$ transition of Tb^{3+}. The excitation spectra revealed prominent excitation bands around 377 and 218 nm [2]. The fluorescence properties were further evaluated using emission spectra, the CIE chromaticity coordinates, and decay time measurements. These results demonstrate that the incorporation of Tb^{3+} significantly influences the structural environment, optical response, and fluorescence characteristics of the glass system, highlighting its potential for optical and display devices applications [3].

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B-34

BEYOND LOCALIZATION IN SUPER-RESOLUTION MICROSCOPY: FROM 3D POSITION TO MOLECULAR IDENTITY

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Abstract. Single-molecule localization microscopy (SMLM) provides nanometric structural information, but each detected molecule also carries additional information through its near-field interaction with its environment, its emission spectrum and its photon flux. Accessing these complementary observables can considerably expand the biological information content of SMLM, enabling both three-dimensional localization and the simultaneous identification of multiple molecular targets.

We first show how the near-field emission of a fluorophore can be exploited for three-dimensional localization close to an interface. In Supercritical Angle Fluorescence (SAF), the evanescent components of the fluorophore near field couple to the higher-index medium and become detectable in the far field. As this coupling strongly depends on the fluorophore–interface distance, SAF provides intrinsic axial information and enables nanometric 3D localization with absolute positioning [1].

For larger imaging depths, this near-field-based approach can be complemented by ModLoc, in which temporally modulated structured illumination encodes the position of each molecule into the phase of its fluorescence signal [2]. ModLoc provides precise axial localization over extended depth ranges and is particularly well suited to complex samples such as spheroids, organoids and tissues.

Beyond spatial localization, fluorophore properties can also be used to distinguish molecular species within a single acquisition. Spectral demixing identifies emitters from differences in their emission spectra, although the required spectral separation generally divides the available fluorescence signal between several detection channels [3]. We therefore introduce Brightness Demixing [4], which instead identifies fluorophores through their intrinsic photon flux under uniform illumination. This approach preserves the entire fluorescence signal and enables the simultaneous imaging of up to three molecular targets using DNA-PAINT. It remains compatible with conventional 2D and 3D SMLM implementations, including SAF-based axial localization.

Together, these approaches illustrate how the information intrinsically carried by individual fluorescence events, combined when necessary with engineered illumination, can transform SMLM from a purely structural imaging method into a multidimensional tool for resolving molecular position and identity in complex biological systems.

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B-35

GAS-MEDIATED STRUCTURAL EVOLUTION OF g-C3N4 UNDER HIGH PRECURSOR LOADING IN A QUASI-CONFINED SYSTEM: BALANCING POLYCONDENSATION AND FRAMEWORK ACCESSIBILITY

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Abstract. Due to the persistent threat of organic pollutant contamination, photocatalytic remediation strategies have become one of the most promising solutions. Graphitic carbon nitride (g-C_3N_4) is a potential polymeric semiconductor for such applications owing to its low cost, simple synthesis, robust physicochemical stability, and favorable electronic band structure for visible-light-driven photocatalytic progress. However, its structural evolution and resultant properties are highly sensitive to the self-generated atmosphere established during thermal polycondensation. In this study, the precursor loading volume (10–50 vol%) was systematically varied within a quasi-confined reaction system to investigate how self-generated gas accumulation effects on the structural development of urea-derived g-C_3N_4. An intermediate loading of 30 vol% sample established the optimal balance between framework condensation and morphological development with enhanced interlayer ordering, a wrinkled porous architecture, and a high specific surface area of 78 $m^2\ g^{-1}$. Raman and X-ray photoelectron spectroscopy analyses confirmed improved local framework organization, consistent with the corresponding optical absorption and photoluminescence trends. The optimized sample (30 vol%) performs the highest photocatalytic activity toward Rhodamine B with complete degradation (100%) within 30 minutes under solar-stimulated light and stable performance for over 8 cycles. These results establish a practical parameter for tuning urea-derived g-C_3N_4 under quasi-confined pyrolysis conditions.

Keywords: g-C_3N_4; photocatalytic degradation; antibiotics; charge-carrier separation.

B-36

LABEL FREE DISEASE MODEL ANALYSIS BASED ON 1700 nm SPECTROSCOPIC OCT IMAGING SYSTEM

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Abstract. Liver diseases typically exhibit a progressive course, beginning with fat accumulation and advancing through inflammation, fibrosis, and cirrhosis. Cumulative changes in tissue structure and function can lead to various complications during this process. To monitor the stages of liver disease, it is essential to image or map lipid droplet accumulation and liver fibrosis. The 1700 nm wavelength band is suited for detecting lipid accumulation due to its strong light absorption by lipid. In this study, we developed a spectroscopic polarization-sensitive OCT(SPS-OCT) imaging system that enables simultaneous spectroscopic imaging and birefringence analysis of tissue using 1700 nm swept-source. To demonstrate its utility for liver disease evaluation, we applied the systems to mouse models of non-alcoholic fatty liver disease (NAFLD) and non-alcoholic steatohepatitis (NASH).

Introduction. Liver diseases typically exhibit a progressive course, beginning with fat accumulation and advancing through inflammation, fibrosis, and cirrhosis. Cumulative changes in tissue structure and function can lead to various complications during this process. To monitor the stages of liver disease, it is essential to image or map lipid droplet accumulation and liver fibrosis [1-3]. The 1700 nm wavelength band is suited for detecting lipid accumulation due to its strong light absorption by lipid [4-6]. In this study, we developed a spectroscopic polarization-sensitive OCT(SPS-OCT) imaging system that enables simultaneous spectroscopic imaging and birefringence analysis of tissue using 1700 nm swept-source. To demonstrate its utility for liver disease evaluation, we applied the systems to mouse models of non-alcoholic fatty liver disease (NAFLD) and non-alcoholic steatohepatitis (NASH) [7,8].

Method. The NAFLD model is a common disease that can occur asymptomatically even in healthy individuals and may act as both a cause and consequence of diabetes. The fatty liver model studies have shown that the accumulation of lipid droplets in the liver plays a crucial role in the progression of these diseases. NASH, a progressed form of simple steatosis, has a high risk of leading to severe complications such as liver fibrosis.

To develop fatty liver models, mice were fed methionine-and choline-deficient (MCD) diet (IVIM technology, Daejeon, Korea), and liver tissues were excised on day 7 and day 14 after the initiation of the diet. For the fibrosis model, carbon tetrachloride (CCl4) was administered three times per week to induce liver fibrosis, and the liver was excised on day 14. In both models, perfusion with D2O solution was performed prior to tissue excision. The excised liver tissues were imaged using the developed SPS-OCT system with a center wavelength of 1680

nm, a bandwidth of ~150 nm, and a sweep rate of 90 kHz. A coupler was used to split the light at a ratio of 10:90 to the reference and sample arm, respectively. Interference occurred between the reflected light from the reference arm and the scattered light from the sample in the polarization maintaining coupler. The interference light was directed to a polarization beam splitter (PBS) at a 50:50 ratio, which then separated into vertical and horizontal components to be detected by balanced photodetectors.

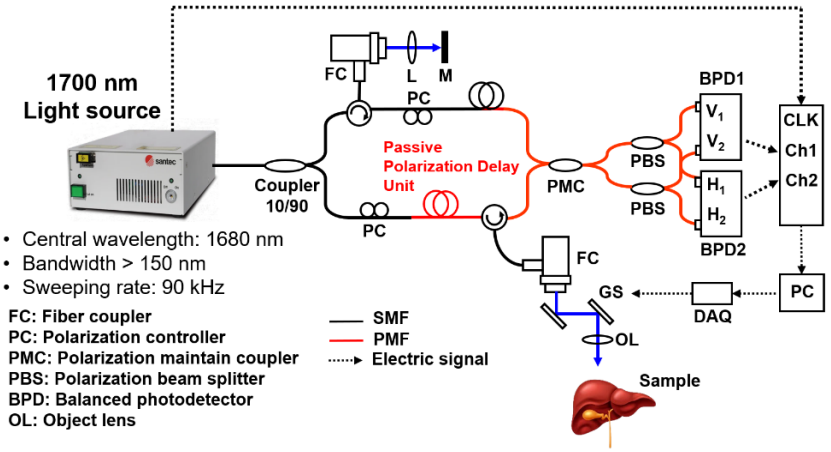

Fig. 1. *Schematic of SPS-OCT system with 1700nm swept laser.*

Results. Figure 2 shows an overall increasement of the relative attenuation coefficients with longer MCD diet duration. In particular, the increase was more pronounced in the 1720nm wavelength range, where lipid absorption is expected to be higher.

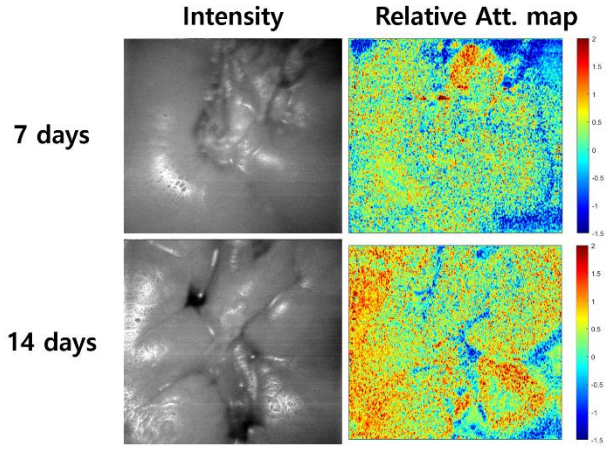

Fig. 2. *Relative attenuation coefficient calculation mapping of MCD diet model.*

As shown in Fig. 3, the phase retardation analysis in the fibrosis model induced by CCl4 administration revealed optical birefringence changes in specific regions of the liver tissue.

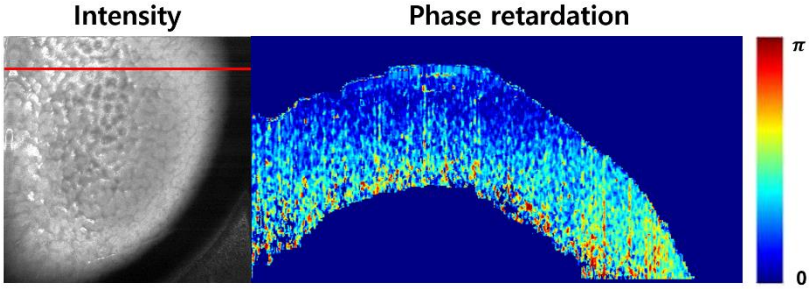

Fig. 3. *Phase retardation image of liver fibrosis model.*

In this study, we employed the SPS OCT imaging system with 1700 nm wavelength range swept-source, which has high absorption of lipids, to assess lipid accumulation in the liver tissue of MCD diet-induced fatty liver mouse models. For the liver fibrosis model, we utilized local retardation analysis based on SPS-OCT to evaluate fibrotic characteristics. The proposed imaging system can analyze lipid distribution and liver fibrosis simultaneously and the multidimensional imaging approach enables the extraction of optical biomarkers relevant to NAFLD and fibrosis for liver disease treatment monitoring.References should appear at the end of the paper in the order in which they are referenced in the body of the paper. The font should be 8-point, and the references should be aligned left.

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B-37

ADVANCED NANOMATERIALS@QNU-ASSMD: FROM MATERIALS DESIGN TO PRACTICAL APPLICATIONS

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Abstract. The development of advanced nanomaterials with tailored physicochemical and functional properties is an active area of research, driven by the growing demand for sustainable solutions to challenges in energy, environmental protection, and climate change. This presentation highlights our research achievements over the past five years of the Advanced semiconductor matatials and devices group, Quy Nhon University (QNU-ASMD) in the design, synthesis, and characterization of functional nanomaterials for sensing, energy storage, and energy conversion. The presentation focuses on three main research directions: (i) novel nanomaterials for lithium-based batteries and sensing applications; (ii) photoelectrocatalytic materials for hydrogen production; and (iii) electro/thermalchromic nanomaterials for smart devices. Particular emphasis is placed on the relationships between material composition, nanostructure, interfacial properties, and functional performance, as well as their implications for the rational design of next-generation materials for sustainable energy and environmental technologies.

B-38

WIDE-RANGE VISIBLE PHOTOLUMINESCENCE OF Nb NANOPARTICLES AND EL DEVICE APPLICATIONS

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Abstract. Transition metal oxides can exhibit drastically different physical properties even with slight differences in their crystal structures, compositions, and oxidation states, owing to the flexibility of their crystal structures and the diversity of their electronic structures. On the other hand, nanostructured materials are well known to exhibit physical properties that differ from those of their bulk counterparts due to quantum size effects and surface effects. Therefore, transition metal oxide nanoparticles are expected to have potential applications as novel functional materials. However, because niobium, a transition metal, is susceptible to oxidation and aggregation, it has been difficult to synthesize single nanosized particles smaller than 10 nm.

We successfully synthesized niobium oxide nanoparticles (Nb NPs) with particle sizes smaller than 4 nm using a DMF reduction method [1]. The surfaces of the Nb NPs are terminated with DMF molecules, making them highly stable and readily redispersible in water and alcohol-based solvents. In solution, the Nb NPs exhibited pale-blue photoluminescence in the visible-light region. The broad emission spectrum could be deconvoluted into approximately five emission components at 2.0, 2.2, 2.8, 3.0, and 3.3 eV. These results suggest that the Nb NPs exhibit RGB emission. In contrast, for Nb NPs deposited on a substrate, the peak energies of the emission spectra shifted toward lower energies. This shift is considered to originate from Förster-type resonance energy transfer. Based on the narrow size distribution of the Nb NPs and the results of photoluminescence lifetime measurements, we consider that the origin of the emission is localized states, such as oxygen defects, within the nanoparticles, while the differences in emission wavelength are attributed to the inhomogeneity of niobium atoms within the nanoparticles.

We fabricated electroluminescent (EL) devices using the Nb NPs as the emitting layer. The EL devices exhibited reddish-purple emission. Since the Nb NPs possess RGB emission, it may be possible to realize EL devices with tunable emission colors by optimizing the fabrication conditions of the devices.

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B-39

FUNDAMENTAL DISSIPATIVE SOLITONS WITH CUBIC–QUINTIC–SEPTIC NONLINEARITIES IN CONVENTIONAL AND $\mathcal{PT}$-SYMMETRIC GAIN–LOSS LANDSCAPES

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Abstract. We investigate two-dimensional fundamental dissipative solitons governed by a complex Ginzburg – Landau equation incorporating cubic, quintic, and septic nonlinearities, confinement, and spatially structured gain and loss. Two configurations are compared: a conventional localized gain–loss landscape and a parity–time ($\mathcal{PT}$)-symmetric distribution with separated gain and loss regions. A nonconservative variational approximation, based on a Gaussian ansatz with dynamical amplitude, widths, phase curvatures, center position, and transverse momentum, yields a reduced system describing stationary states and their stability. The analysis reveals how competition among the cubic, quintic, and septic terms controls soliton amplitude, width, existence, and stability domains. In the $\mathcal{PT}$-symmetric regime, antisymmetric gain and loss generate an internal power current, phase gradient, displacement, and transverse momentum. Linearization identifies stationary, drifting, and oscillatory regimes. Direct simulations of the equation validate the predicted profiles, stability boundaries, propagation dynamics, and global gain–loss balance, demonstrating the effectiveness of the NCVA framework for nonlinear dissipative systems.

Keywords: dissipative solitons; cubic–quintic–septic nonlinearity; nonconservative variational approximation; $\mathcal{PT}$ symmetry; complex Ginzburg – Landau equation.

B-40

ALUMINUM-MODIFIED GRAPHITIC CARBON NITRIDE FOR EFFICIENT REMOVAL OF TETRACYCLINE FROM AQUEOUS SOLUTION

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Abstract. The widespread use of tetracycline (TC) has raised growing environmental concerns due to its persistence and potential ecological risks, highlighting the need for efficient removal technologies. In this work, Al-doped graphitic carbon nitride (g-C_3N_4) was synthesized via a facile one-step thermal polymerization method to improve the adsorption and photocatalytic removal of TC. XRD and FESEM analyses reveal that Al incorporation regulates the thermal condensation process, modifies the triazine/heptazine structural balance, and induces defect formation, leading to a porous sponge-like morphology with the highest specific surface area of 54 $m^2\ g^{-1}$ at 0.5 mol% Al doping. UV–Vis spectroscopy further demonstrates enhanced visible-light absorption and gradual bandgap narrowing after Al incorporation. Owing to the combined effects of increased surface area and Al-related surface active sites, the optimally doped sample (AlCN-0.5) exhibits the highest adsorption capacity, removing approximately 35% of TC during the dark adsorption stage, followed by the best overall photocatalytic performance under simulated solar irradiation. In contrast, excessive Al incorporation results in structural densification and defect-induced charge-carrier recombination, leading to reduced photocatalytic activity. These results demonstrate that moderate Al incorporation effectively tailors both the structural and electronic properties of g-C_3N_4, providing a simple and cost-effective strategy for developing carbon nitride-based photocatalysts for antibiotic wastewater treatment. Keywords: Al-doped g-C3N4; Tetracycline; Chemisorption; Chelation; Structural defects.

B-41

BURSTT DEVELOPMENT AND ANALYSIS: TRANSFER OF CALIBRATION WITH NOISE SOURCE EMITTER

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Abstract. In radio interferometric arrays, it is crucial to have an accurate relative delay calibration for coherent signal processing. This work investigates the use of a nearby noise source emitter to determine the antenna delays in the Bustling Universe Radio Survey Telescope in Taiwan (BURSTT) and compares the results with calibration derived from Sun observations. Covariance matrices were constructed from noise source ON and OFF measurements, and eigenmode analysis was used to find the relative antenna delays, combined with the application of Fourier-transform-based delay fitting. Since the measured noise source delays contain the contribution of both geometric delay and system instrumental delay, the instrumental delays derived from Sun observation were subtracted to estimate the geometric delay of the noise source. This geometric delay was compared with the theoretical near-field delays calculated from the antenna-array configuration and assumed noise-source position. Most antenna rows show consistent trends with the expected geometric delay pattern; however, there are still some discrepancies in particular groups of antennas. These results show that the noise-source emitter can provide useful measurements of relative antenna delays and can be used to evaluate the geometric delay across the antenna array, which suggests its potential to be used as an additional tool for evaluating antenna-delay calibration at BURSTT main station.

Keywords: coherent signal, calibration, noise source emitter, covariance matrix, eigenmode, geometric delay, instrumental delay.

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SESSION POSTER I

PI-01

REAL-TIME MONITORING OF O_3 DEGRADATION UNDER LABORATORY CONDITIONS USING A DOAS SYSTEM BASED ON A MODELESS Ce:LiCAF LASER

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Abstract. This paper presents the research and evaluation of the real-time monitoring capability of ozone (O_3) concentration degradation under laboratory conditions using a Differential Optical Absorption Spectroscopy (DOAS) system based on an ultra-broadband (modeless) Ce:LiCAF ultraviolet laser source. The spectral analysis and fitting were optimally performed within the 275 – 305 nm wavelength window using QDOAS software, allowing for the precise retrieval of O_3 concentrations from experimental data. The results demonstrate that the system clearly tracks the degradation kinetics of O_3, with an initial recorded concentration of 327.75 ppm, which continuously decreased to 13.19 ppm after approximately 100 minutes of observation. The quality of the spectral fitting maintained high stability throughout the measurement process, as evidenced by the RMS residual values fluctuating within a narrow range from 5.13×10^{-5} to 5.97×10^{-5}. Based on the retrieved concentration errors (2.45 – 2.92 ppm), the limit of detection (LOD) and limit of quantification (LOQ) of the system were determined to be 8.4 ppm and approximately 28 ppm, respectively. These results demonstrate the feasibility, reliability, and flexibility of the DOAS system based on the ultra-broadband Ce:LiCAF UV laser in quantifying and monitoring polluting gases, laying a crucial foundation for expanding its application to field environmental monitoring in the future.

Keywords: Ce:LiCAF crystal, Ultraviolet solid-state laser, narrow-linewidth laser, tunable laser.

PI-02

OPTICAL DESIGN AND PERFORMANCE EVALUATION OF AN F-θ LENS FOR HIGH-SPEED LASER PROCESSING SYSTEMS

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Abstract. This paper presents the optical design and performance evaluation of an f-θ lens for high-speed, large-field laser processing applications such as marking, engraving, and cladding. The lens is designed for a wavelength of 1.064 μm with a focal length of 100 mm, an entrance pupil diameter of 12 mm, and a scan field of 70 mm × 70 mm. A three-element reverse-telephoto architecture is adopted to achieve diffraction-limited focusing, maintain f-θ distortion below 0.1%, and provide a long back focal distance compatible with galvanometer scanner integration. The design methodology incorporates aberration control strategies, optimization for high-order aberrations, and rigorous distortion constraints. Performance analyses via spot diagrams, MTF, and distortion plots confirm that the system meets all specifications, with RMS spot radii smaller than the Airy disk. Mechanical manufacturability and assembly constraints are also addressed. The resulting lens offers a practical, cost-effective solution for precision laser processing.

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PI-03

STRUCTURAL AND CS_2-INFILTRATION EFFECTS ON CONFINEMENT LOSS IN $As_{39}Se_{61}$ SUSPENDED-CORE FIBERS

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Abstract. This study investigates the effect of the geometric ratio w/r_c on the confinement loss (L_c) of $As_{39}Se_{61}$ chalcogenide suspended-core fibers (SCFs) with air-filled and CS_2-filled holes. The modal characteristics are simulated using the finite element method implemented in Lumerical MODE Solutions, with w/r_c varied from 0.45 to 0.95. The results show that the effects of geometry and polarization state on L_c become more pronounced at longer wavelengths. Notably, at $\lambda \approx 6.0$ μm, CS_2 infiltration reduces L_c by approximately 29% compared with the corresponding air-filled configuration. These results demonstrate that combining geometric-ratio adjustment with CS_2 infiltration provides an effective means of controlling the confinement loss of $As_{39}Se_{61}$ SCFs in the mid-infrared region.

Keywords: suspended-core fiber; $As_{39}Se_{61}$ chalcogenide glass; confinement loss; CS_2 infiltration; mid-infrared optics.

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PI-04

FABRICATION OF PERIODOC MICRO/NANO STRUCTURE USING TWO-PHOTON DIRECT LASER WRITING AND METAL SPUTTERING

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Abstract. Metal-coated dielectric-pillar plasmonic metasurfaces are fabricated by combining two-photon direct laser writing (TP-DLW) with DC magnetron sputtering. Periodic templates consisting of one-dimensional to three-dimensinal structures are written on cover-glass substrates with a 532 nm femtosecond laser focused through a numerical aperture NA = 1.4 immersion objective, using a single set of writing parameters that is found to transfer between geometries. Scanning electron microscopy (SEM) and Thornton model were used to evaluate the fabricated structures.

PI-05

STABILIZATION of KERR MICROCOMB REPETITION RATE BY USING FIBER REFERENCE

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Abstract. Optical microcombs are promising for terahertz (THz) signal generation, but their spectral purity is limited by intermodal phase noise. In this study, the authors stabilized this noise using a two-wavelength delayed heterodyne interferometer. By feeding back the extracted error signal to a servo controller, they successfully stabilized the comb's repetition rate. This method significantly improved the generated THz signal's stability, achieving a phase noise of -80 dBc/Hz at a 10 kHz offset and reducing the standard deviation of frequency fluctuations from 1.01 × 10 Hz to 3.37 × 10 Hz.

Introduction. Optical microcombs have emerged as compact and versatile sources for a wide range of applications, including frequency metrology, spectroscopy, optical communications, and lidar. Their ability to generate a large number of mutually coherent optical modes on a chip-scale platform has enabled significant advances in integrated photonics. In particular, low-phase-noise microwave and terahertz (THz) signal generation has attracted significant attention, driven by its potential for high-speed wireless communications, precision spectroscopy, and non-destructive testing. In these applications, phase noise directly limits system performance, such as communication fidelity, spectral resolution, and accuracy in phase-sensitive measurements. For example, THz communication systems are strongly affected by phase noise as a key hardware impairment, especially at high carrier frequencies , while high-resolution spectroscopy requires extremely narrow linewidth and high spectral purity to resolve fine molecular features. Conventional approaches for THz wave generation include electrical frequency multiplication and photomixing using independent continuous-wave (CW) lasers. In frequency multiplication schemes, a highly stable radio-frequency (RF) reference is multiplied to reach the THz regime. However, phase noise inevitably increases with the multiplication factor, typically scaling as 20log(N), which significantly degrades spectral purity at higher frequencies. Alternatively, optical photomixing using two independent CW lasers generates THz signals from the difference frequency of two optical tones. However, the stability of the generated THz signal is strongly limited by the relative phase noise between the two lasers, which accumulates due to their independent operation. To overcome these limitations, optical frequency combs, particularly microcombs, provide a promising alternative. Owing to their large mode spacing and mutual coherence among comb lines, microcombs enable direct generation of millimeter-wave and THz signals via optical heterodyning without the need for high-order frequency multiplication. In such systems, the spectral purity of the generated signal is directly determined by the relative phase noise between comb modes. While stabilization of global comb parameters such as the repetition rate and carrier-envelope offset frequency has been extensively studied, these approaches do not necessarily suppress intermodal relative

noise. In this work, we demonstrate stabilization of intermodal relative phase noise in a microcomb using two-wavelength delayed heterodyne interferometer (TWDI) [1], enabling improved spectral purity in heterodyne-based signal generation.

Experimental setup. The TWDI-based stabilization setup for the repetition rate f is shown in Fig. 1. First, the residual pump light in the microcomb output is suppressed using a band-stop filter (BSF). The filtered signal is then split into two arms: a frequency-shift arm employing an acousto-optic modulator (AOM), and a delay arm consisting of a spool fiber. Interference between the frequency-shifted and delayed microcomb signals produces an optical beat signal whose phase difference reflects fluctuations in the repetition rate. As a result, the obtained interference signal carries the phase noise of f. The optical frequency of each comb mode is given by $f = f + nf$, indicating that fluctuations in both the pump frequency f and the repetition rate f are transferred to the TWDI signal. To suppress the contribution from f while enhancing sensitivity to f , the beat signal corresponding to two comb modes at different wavelengths is extracted using a band-pass filter (BPF). This signal is used as the input to a servo controller, which stabilizes f by modulating the frequency and/or intensity of the pump laser driving the microcomb.

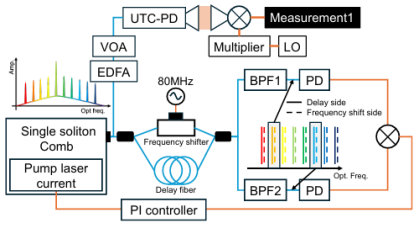

Fig. 1. *Experimental setup Result BPF2 PD Opt. Freq.*

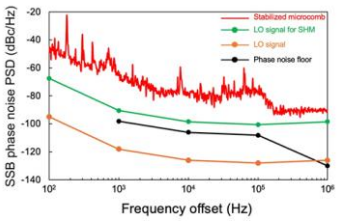

Fig. 2. *Phase noise of the generated THz signal without control (red) and with control (blue).*

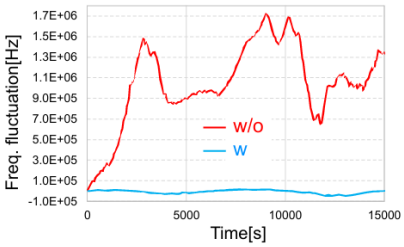

Fig. 3. *Frequency fluctuations in the time domain.*

Result. Figure 2 shows the phase noise of the THz signal generated by the microcomb. A phase noise level of −80 dBc/Hz is achieved at an offset frequency of 10 kHz. Figure 3 shows the standard deviation of the frequency fluctuations is reduced from 1.01 × 10 Hz to 3.37×10 Hz. A noise reduction in the double-digit range was confirmed. SSB phase noise PSD (dBc/Hz)

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PI-06

COMPARATIVE STRUCTURE, OPTICAL AND ELECTRICAL CHARACTERISTICS OF SOL-GEL-DEPOSITED Mn-, Co-, AND Sn-DOPED CuO THIN FILMS

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Abstract. In this work, multicomponent $Cu_{1-x-y-z}Mn_xCo_ySn_zO$ thin films were successfully fabricated on glass substrates via the sol-gel spin-coating method. The crystallite size was found to decrease with doping, reaching a minimum value of 16.41 nm for the 5% Co-doped sample (M3). Scanning electron microscopy (SEM) analysis revealed a reduction in average particle size and an overall improvement in surface quality, characterized by uniform and densely packed nanoparticles. Furthermore, the absorption figure of merit (a-FOM) exhibited an upward trend as the Mn, Co, and Sn doping concentrations increased. UV-Vis absorption measurements indicated that the optical bandgap ranges from 2.01 eV to 2.23 eV. Notably, the sheet resistance of the $Cu_{1-x-y-z}Mn_xCo_ySn_zO$ films decreased sharply from 1.30 to 0.26 MΩ/sq for the M3 sample. These properties suggest that $Cu_{1-x-y-z}Mn_xCo_ySn_zO$ thin films represent promising p-type candidates for thin-film transistors (TFTs) and conductive channels in advanced electronic applications.

***Keywords**:* Thin film, CuO, Sol-gel, P-type semiconductor.

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PI-07

DEVELOPMENT OF IMAGE QUALITY EVALUATION CRITERIA FOR EYEPIECES USED FOR MICRODISPLAY VIEWING IN AIMING AND OBSERVATION DEVICES

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Abstract. This paper presents a systematic approach to evaluating the image quality of optical systems incorporating microdisplays for aiming and observation applications. The study focuses on establishing a set of objective and quantitative criteria that can be used to assess the imaging performance of optical systems designed for such applications. A theoretical framework is developed to identify the relevant image-quality parameters and establish the corresponding evaluation methods and reference criteria. The proposed criteria are then applied to several optical systems that have been designed and manufactured, allowing their imaging performance to be quantitatively evaluated and compared. The results demonstrate the applicability of the proposed evaluation framework and provide a practical basis for assessing and comparing the image quality of microdisplay-based optical systems used in aiming and observation devices. The proposed approach can also serve as a reference for the design, optimization, and experimental evaluation of such optical systems.

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PI-08

FABRICATION AND PERFORMANCE OF A LOW-COST ZnO-BASED UV SENSOR ON PCB

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Abstract. Reliable and low-cost ultraviolet (UV) sensors are increasingly required for environmental monitoring, personal health protection, and portable electronic devices. In this work, a compact UV-A microsensor was developed by directly depositing ZnO nanomaterials onto a commercial printed circuit board (PCB) with pre-patterned interdigitated nickel-plated copper electrodes. ZnO nanorods were synthesized via a simple chemical precipitation method and coated onto the sensing region to form an active layer. The fabricated sensors exhibited a stable and repeatable resistance response under UV-A illumination (λ = 395 nm), together with a linear response over the incident UV power density range of 100-400 $\mu W \cdot cm^{-2}$. In addition, the PCB-based architecture enables straightforward integration with commercially available signal acquisition and display circuits, providing a simple, scalable, and cost-effective platform for practical UV monitoring applications.

Key words: Ultraviolet sensors, ZnO nanorods, UV-A sensor.

PI-09

SU-8 MICROFIBER LASERS FABRICATED BY DIRECT DRAWING

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Abstract. Polymer microlasers have attracted considerable attention owing to their compact size, low fabrication cost, and broad potential in integrated photonics and optical sensing. Among various polymer materials, SU-8 is particularly attractive because of its excellent optical transparency, high refractive index, good mechanical flexibility, and compatibility with diverse microfabrication techniques. However, the fabrication of SU-8 microfiber lasers typically relies on conventional lithographic processes, which increase fabrication complexity and cost. In this work, we report a simple direct-drawing method for fabricating Rhodamine B-doped SU-8 microfiber lasers. SU-8 microfibers were directly drawn onto glass substrates and subsequently soft baked at 90°C for 6 min to obtain mechanically stable laser cavities. Optical microscopy and scanning electron microscopy reveal smooth, uniform microfibers which can be readily configured into different cavity geometries. Under pulsed optical excitation (532 nm), the fabricated microfibers exhibit stable multimode laser emission with a low threshold of approximately 33 μJ mm^{-2}. The regular mode spacing observed in the emission spectra suggests the presence of resonant optical feedback within the microfiber cavity. Furthermore, stable laser emission is also achieved from a D-shaped microfiber cavity, exhibiting a narrow linewidth of approximately 0.2 nm and a corresponding quality factor exceeding 3200. The proposed direct-drawing approach provides a simple, low-cost, and versatile route for fabricating flexible polymer microfiber lasers, offering promising potential optical sensing applications.

PI-10

EFFECT OF OXYGEN-NITROGEN ANNEALING ENVIRONMENT ON PHOTOELECTRIC PROPERTIES OF CuO THIN FILMS FABRICATED BY SPUTTERING

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Abstract. CuO thin films were successfully fabricated on glass substrates via direct current (DC) magnetron sputtering and subsequently annealed at 450 °C under varying O_2/N_2 gas flow ratios. X-ray diffraction (XRD) analysis confirmed that the films possess a monoclinic structure with a highly preferred (111) orientation. Surface morphology, characterized by scanning electron microscopy (SEM), revealed crack-free nanoparticles. The O_2 concentration during annealing was found to be a decisive factor; as the flow ratio increased, the average particle size significantly decreased from 385.53 nm in a pure environment to 171.63 nm in pure , yielding a markedly smoother and more uniform surface. Regarding the optoelectronic properties, the CuO films exhibit an optical bandgap ranging from 1.73 eV to 2.15 eV, a high light absorption coefficient of 10^5 cm^{-1}, and optimal absorption quality as quantified by the absorption figure of merit (a-FOM). Furthermore, the sheet resistance varies between 1.63 and 2.68 $M\Omega/sq$, with the minimum resistance achieved at an O_2/N_2 ratio of 0.8:0.2. These eco-friendly p-type CuO thin films represent promising candidates for advanced optoelectronic applications, including high-efficiency solar cell absorber layers, gas sensors, and next-generation thin-film transistors (TFTs)

***Keywords**:* Thin film, CuO, Sputtering, P-type semiconductor.

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PI-11

SIZE-CONTROLLED POROUS PVA MICROSPHERES FOR MICROSCALE RANDOM LASERS

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Abstract. Miniaturized random lasers possess unique physical properties and hold considerable promise for compact photonic devices [1-3]. However, precise control over their size and structure using a simple and scalable fabrication approach remains challenging [4]. In this study, we employ inkjet printing combined with selective chemical etching to fabricate rhodamine B-doped polyvinyl alcohol (PVA) microspheres with a porous structure [5]. Randomly distributed pores with an average diameter of 1.28 μm are formed throughout the microspheres, providing strong optical scattering and promoting random lasing. Clear lasing emission was observed under optical excitation, with a 34 μm-diameter microsphere fabricated from the 4 wt% PVA solution showing a lasing threshold of approximately 382 μJ mm^{-2} and a central lasing wavelength of approximately 581 nm. Notably, the fabricated microspheres exhibit a high degree of dimensional uniformity, with approximately 80% of the microspheres falling within a narrow size range. In addition, reducing the PVA concentration in the precursor solution from 4 to 1 wt% decreased the average microsphere diameter from approximately 34 to 21 μm, accompanied by a nearly twofold increase in the lasing threshold. Overall, the results highlight inkjet printing as a straightforward and scalable route for fabricating microsphere lasers with well-controlled dimensions and reliable optical performance.

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PI-12

INTERFERENCE-BASED NONLINEAR OPTICAL TWEEZERS FOR DYNAMICALLY SCALABLE 2D NEUTRAL ATOM ARRAYS

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Abstract. Scalable two-dimensional (2D) neutral atom arrays are essential for fault-tolerant quantum computing. We propose and theoretically investigate a two-dimensional interference-based nonlinear optical tweezers (2D iNOT) architecture for dynamically generating neutral atom arrays. Laser-power modulation enables two nonmechanical control mechanisms: Kerr-induced subwavelength axial translation and an analytical capacity-scaling law based on the Gauss circle problem. At an incident power of 150 mW, the architecture achieves a rigid axial displacement of 4.8 nm and supports a 45-site pseudo-circular atomic register while preserving the lattice spacing. Three-dimensional potential analysis and two-dimensional Langevin simulations confirm stable multisite confinement without collisional crosstalk. The proposed 2D iNOT architecture provides a scalable and vibration-free platform for dynamic two-dimensional neutral atom arrays, offering a promising route toward next-generation neutral-atom quantum computing.

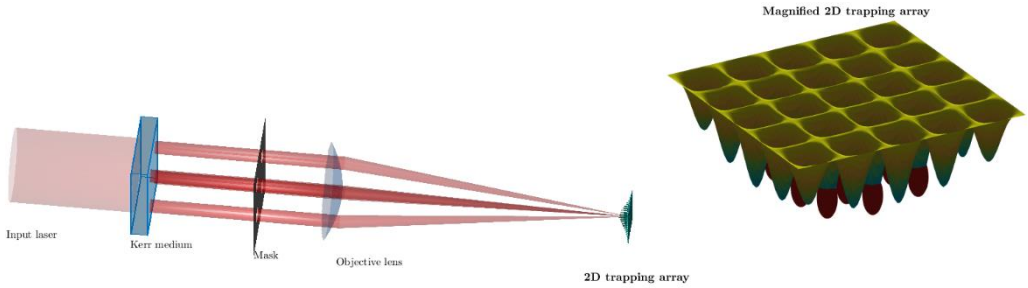

Fig. 1. *Horizontal 3D schematic of the 2D iNOT architecture.*

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PI-13

GROUP VELOCITY DISPERSION CONTROL IN AN $AS_{38.8}SE_{61.2}$-BASED SUSPENDED-CORE PHOTONIC CRYSTAL FIBER WITH CS_2-FILLED AIR HOLES

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Abstract. This study investigates group velocity dispersion (GVD) control in an $As_{38.8}Se_{61.2}$-based suspended-core photonic crystal fiber (SCF) with three CS_2-filled holes. The modal and dispersion characteristics are numerically analyzed using the finite element method (FEM), with the geometric ratio w/r_c varied from 0.50 to 1.00. The results show that both structural variation and CS_2 infiltration significantly modify the GVD characteristics. Compared with the air-filled SCF, CS_2 infiltration reduces the magnitude of the minimum GVD from approximately 2.55 to 0.45 ps^2/m, corresponding to a reduction of about 82%. For the CS_2-filled SCF, increasing w/r_c from 0.50 to 1.00 further reduces the minimum GVD magnitude from approximately 0.45 to 0.05 ps^2/m and shifts the zero-dispersion wavelength (ZDW) from 4.95 to 4.15 μm. These results demonstrate that combining geometric tuning with CS_2 infiltration provides an effective approach for controlling GVD in the mid-infrared region.

PI-14

EFFECTS OF SUPPLEMENTAL LED LIGHTING DURATION ON GROWTH AND BIOACTIVE PROPERTIES OF PATCHOULI (POGOSTEMON CABLIN) ESSENTIAL OIL

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Abstract. Supplemental artificial lighting has emerged as an effective strategy for improving the productivity and quality of medicinal and aromatic plants cultivated under fluctuating field conditions. This study investigated the effects of supplemental LED lighting duration on the growth, essential oil production, chemical composition, and bioactive properties of patchouli (*Pogostemon cablin*) grown under open-field conditions in Hanoi, Vietnam. Plants were exposed to nighttime supplemental LED lighting for 4, 6, or 8 h night^{-1} at a photosynthetic photon flux density (PPFD) of 80 μmol m^{-2} s^{-1} with a spectral composition of red:blue:UV-A: Green (47:37:8:8) throughout the cultivation period, while plants grown under natural sunlight served as the control. Supplemental LED lighting significantly enhanced plant growth, biomass accumulation, and essential oil yield ($P < 0.001$). GC–MS analysis showed that the relative abundances of the major sesquiterpenes, including patchoulol, α-bulnesene, α-guaiene, and seychellene, varied significantly with lighting duration, indicating that supplemental lighting influenced both the yield and chemical composition of the essential oil. In addition, essential oils extracted from LED-treated plants exhibited enhanced antimicrobial and antioxidant activities, together with increased inhibitory activity against HepG2 cells. These findings demonstrate that optimizing the duration of supplemental LED lighting can simultaneously enhance biomass production, essential oil yield, chemical quality, and biological activities of *P. cablin*. This approach provides a practical and sustainable cultivation strategy for improving the commercial production of patchouli under open-field conditions.

PI-15

TAILORING THE FUNCTIONALITIES OF NEAR-INFRARED SURFACE PLASMON RESONANCES IN HYBRID METAL-DIELECTRIC METASURFACES

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Abstract. Over the past two decades, nanophotonics and plasmonics have provided powerful approaches for controlling light–matter interactions at subwavelength scales, driving the development of compact devices for near-infrared telecommunication and sensing applications. In this study, we investigate a hybrid metal–dielectric plasmonic metasurface operating in the near-infrared (NIR) region, with a focus on clarifying the optical interactions within the structure and the physical role of the dielectric layer in modifying its resonant response. The proposed structure consists of a silicon (Si) substrate with circular holes, combined with silver (Ag) and silicon dioxide (SiO_2) layers deposited on the surface and within the holes. Finite-Difference Time-Domain (FDTD) simulations are combined with theoretical models to analysis a quantitative framework linking structural parameters, modal characteristics, and optical responses. The results show that the Ag structure exhibits a primary resonance near 1531.67 nm, which shifts to approximately 1540.54 nm after introducing the SiO_2 layer between Ag and Si. The dielectric layer also suppresses minor resonances in the investigated NIR range and modifies the phase response of the reflected light, highlighting its active role beyond that of a passive spacer. The agreement between FDTD simulations and theoretical models provides insight into the physical mechanisms governing resonance in hybrid metal–dielectric plasmonic metasurfaces and establishes a foundation for the rational design of NIR plasmonic structures for sensing, commuication, and integrated optoelectronic applications.

Keywords: Hybrid metal-dielectric structure, plasmonic metasurface, NIR plasmonic structures.

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PI-16

ENHANCED EXTERNAL QUANTUM EFFICIENCY IN SILICON-BASED PHOTODETECTOR VIA A LAYER-BY-LAYER PHOTOMULTIPLICATION HETEROJUNCTION

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Abstract. Ultraviolet (UV) sensing plays an important role in safety-monitoring applications, particularly in the detection of invisible flames. Flames produced by fuels such as hydrogen and alcohol can generate weak UV emission through the chemiluminescence of electronically excited species. Selective detection of this emission with minimal interference from ambient light is therefore essential for reliable flame monitoring. However, the ultralow emission intensity presents a major challenge for conventional photodiodes, which typically lack internal gain and exhibit external quantum efficiencies (EQEs) below 100%. In this study, we present a vertical p-n-p device architecture designed to induce photomultiplication (PM) under UV illumination. Photogenerated electron trapping facilitates hole injection, enabling the device to achieve an EQE exceeding 500% under 302-nm illumination with an incident power density of 0.4 mW cm^{-2} at a low bias voltage of −3 V. Unlike conventional high-gain photoconductors, the device employs a thin electron-trapping layer that serves as an efficient PM trigger while maintaining a sub-100-ms response time. These results demonstrate a low-voltage PM strategy for detecting weak UV signals in flame-monitoring applications.

PI-17

EFFECT OF GAUSSIAN BEAM WAIST ON SPHERICAL ABERRATION IN NONLINEAR ASPHERICAL LENSES

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Abstract. Kerr-induced nonlinear aspherical lenses (NAL) are adaptive optical elements whose optical properties can be dynamically controlled through laser beam parameters. While previous studies have mainly focused on the effects of laser power and nonlinear material properties, the role of Gaussian beam waist in governing the optical performance of NAL has not been systematically investigated. In this work, an equivalent aspherical lens model is employed to establish a quantitative relationship between Gaussian beam waist, equivalent lens geometry, and third-order spherical aberration. Analytical expressions for the equivalent radius of curvature and conic constant are derived as functions of beam waist and incorporated into the aberration model, followed by numerical simulations. The results demonstrate that increasing the beam waist significantly suppresses spherical aberration by reducing the Kerr-induced refractive-index gradient while simultaneously modifying the equivalent lens geometry. More importantly, this study identifies the Gaussian beam waist as not merely a beam parameter but an effective optical design variable for controlling spherical aberration and optimizing the performance of nonlinear aspherical lenses in adaptive laser optical systems.

PI-18

LASER WAVELENGTH SELECTION AND PARAMETER DESIGN FOR LONG-RANGE ELECTRO-OPTICAL DETECTION

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Abstract. Active laser detection based on the cat's-eye effect is an effective approach for detecting enemy electro-optical (EO) devices at long distances. The detection performance depends on several laser emission parameters, including wavelength, output power, and beam divergence. This paper presents a method for calculating and optimizing these parameters for an active EO detection system. First, the spectral characteristics of typical EO devices are analyzed to determine a suitable laser wavelength that improves optical coupling and enhances the cat's-eye return signal. Subsequently, a laser parameter model considering beam divergence, target objective diameter, and detection range is established to determine the required laser output power for a detection distance of 2.5 km. Using an existing 1 km detection system as the reference, the proposed method provides optimized laser emission parameters for long-range operation. The proposed approach provides a practical basis for the design and performance improvement of future active electro-optical detection systems.

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PI-19

PHOTONIC EXCITATION-AWARE META-INITIALIZATION FOR MOLECULAR VQE UNDER GEOMETRY-INDUCED CORRELATION SHIFT

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Abstract. Learned warm starts can reduce early variational quantum eigensolver (VQE) errors, but their benefits may disappear during downstream optimization or under correlation shift. We propose a shared photonic excitation-aware meta-initializer that combines MP2 priors, excitation-level descriptors, and a simulated MerLin photonic context to generate variable-length UCCSD parameters for H4, BeH2, and N2 without molecule-specific output heads. The model is evaluated on longer, held-out bond geometries using ten common training seeds and identical downstream UCCSD, Adam, and trust-radius settings, with Hartree–Fock, MP2, and a near-capacity-matched classical context model as controls. Photonic initialization achieves the lowest descriptive median initial errors for H4 and BeH2 and slightly lower trajectory-integrated errors than the classical model. However, these differences are almost entirely erased after 60 downstream optimization steps, and no photonic–classical advantage remains statistically significant after Holm correction. For stretched N2, performance degrades under a substantially stronger correlation shift, and Hartree–Fock yields the lowest final error. Diagnostic analyses associate these outcomes with optimization washout, meta-training limitations, and reduced context utility outside the training regime rather than vanishing context gradients or representation collapse. The results establish a controlled benchmark for photonic VQE initialization while leaving hardware validation and quantum computational advantage unresolved.

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PI-20

OPTICAL TRANSITIONS AND EXCITED-STATE DYNAMICS OF MoS_2 QUANTUM DOTS REVEALED BY STEADY-STATE AND TIME-RESOLVED SPECTROSCOPY

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Abstract. MoS_2 quantum dots (MoS_2 QDs) have attracted considerable attention owing to their size-dependent electronic structure, strong light-matter interaction, and tunable optical response arising from quantum confinement and surface effects. In this work, we systematically investigated the optical properties and excited-state dynamics of MoS_2 QDs using a combination of steady-state and time-resolved spectroscopic techniques. UV–Vis absorption spectroscopy was employed to investigate the characteristic electronic transitions and optical absorption behavior of the MoS_2 QDs, while photoluminescence (PL) spectroscopy was used to evaluate their emission characteristics and radiative recombination processes. Photoluminescence excitation (PLE) spectroscopy was further applied to clarify the relationship between excitation and emission states. Time-resolved photoluminescence (TRPL) measurements were performed to determine the excited-state lifetime and provide insight into carrier recombination dynamics. Raman spectroscopy was additionally used to investigate the structural and vibrational characteristics of the MoS_2 QDs. The combined spectroscopic results demonstrate that quantum-confined electronic states, surface-related states, and defect-mediated recombination pathways strongly govern the optical response of MoS_2 QDs. The correlation between steady-state emission and carrier lifetime provides further insight into the relaxation and recombination mechanisms following photoexcitation. These results contribute to a better understanding of the optical physics of MoS_2 QDs and provide a spectroscopic basis for their potential applications in photodetectors, light-emitting devices, optical sensors, and other nanoscale optoelectronic systems.

Keywords: *MoS_2 quantum dots; optical spectroscopy; photoluminescence; time-resolved spectroscopy; quantum confinement; excited-state dynamics.*

PI-21

SIMULATION THE STABLE SPACE OF LOW – INDEX NANOPARTICLE UNDER HOLLOW- GAUSIAN BEAM TRAP

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Abstract. In this paper, the stable space of a low- index nanoparticle under action of the optical trap using the hollow - Gaussian laser beam is presented. The nonlinear Michelson interferometers to shape a hollow - Gaussian beam configuration is proposed. Based on the optical forces acting on the low- index nanoprticle to trap low- index nanoparticle, stable trapping space is numerically simulated. And then the dependence of the stable space on the principle parameters are investigated. The obtained results demonstrate an effective method for controlling the trapping stability and trapping volume by adjusting the optical parameters. Finally, the opportunity to trap and manipulate nano objects as well as neutral atom is also discussed.

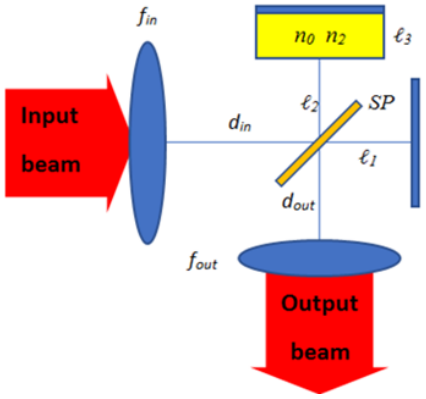

Fig. 1. *Michelson interferometer allowing to transform an input Gaussian beam into a different intensity profile beam*

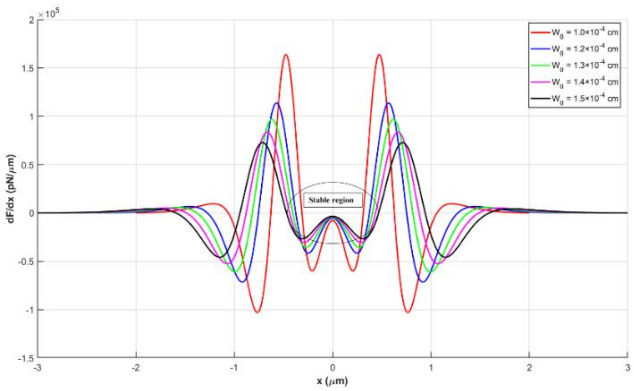

Fig. 2. *Stable regions of glass nanoparticles embedded in carbon disulfide trapped by a hollow beam from the semi-nonlinear Michelson interferometer (SNMI).*

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PI-22

DESIGN, DEVELOPMENT AND PERFORMANCE EVALUATION OF A LOW-COST HANDHELD THERMAL CAMERA BASED ON THE MLX90640 INFRARED SENSOR

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Abstract. This paper presents a low-cost handheld thermal camera using the MLX90640 sensor for industrial monitoring. The system integrates a 32×24 thermal sensor with an RGB camera and a 7-inch display, operating in visible, thermal, and fusion modes. A key contribution is the implementation of a two-point Non-Uniformity Correction (NUC) combined with polynomial calibration using a blackbody reference, significantly improving measurement accuracy. Performance evaluation shows that the raw sensor error of 2.46°C is reduced to 0.98°C after calibration across the 0-100°C range, representing a 60.1% improvement, with an average NETD of 236 mK and an expanded uncertainty of 1.04°C (k=2, 95%). The fusion algorithm enables accurate hotspot localization in electrical and mechanical systems. At approximately 200 USD, the system offers a cost-effective solution for industrial temperature monitoring and predictive maintenance.

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PI-23

DESIGN AND EXPERIMENTAL EVALUATION OF A 940-NM FREE-SPACE OPTICAL LINK FOR AUDIO AND LOW-RATE DATA TRANSMISSION

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Abstract. Free-space optical communication (FSO) offers a practical complement to radio-frequency and fiber-optic links thanks to its license-free optical spectrum, high spatial directivity, immunity to electromagnetic interference, and rapid deployment capability. This work presents the experimental characterization of a compact, low-cost 940-nm FSO communication prototype based on intensity modulation and direct detection. The transmitter employs a QL94R6SA laser diode driven by a current-controlled direct-modulation circuit, while the receiver uses a Hamamatsu S1223 Si PIN photodiode with a 30-mm optical aperture. The measured light–current characteristic shows a broad, nearly linear region above threshold, with an estimated threshold current of 38 mA and a differential slope efficiency of 0.92 W/A. A DC bias current of 180 mA was selected as the operating point, providing sufficient linear modulation headroom with low waveform distortion. The measured −3 dB transmitter modulation bandwidth is approximately 0.76 MHz, whereas the end-to-end optical link bandwidth is approximately 0.14 MHz. At 20 kHz, the link response decreases by only 0.76 dB relative to 1 kHz. For a sinusoidal modulation current of ±50 mA, the received total harmonic distortion is approximately 1.42%. Stable analog audio transmission was also demonstrated over a free-space distance exceeding 300 m, confirming the feasibility of the proposed low-cost FSO platform.

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PI-24

DESIGN AND EXPERIMENTAL CHARACTERIZATION OF A QUADRANT PHOTODETECTOR RECEIVER FOR LASER SPOT TRACKING

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Abstract. Accurate laser spot tracking and angle-of-arrival estimation are essential for optical alignment, beam steering, target designation, and closed-loop pointing. This paper presents the design and experimental characterization of a silicon four-quadrant photodetector (QPD)-based receiver for laser spot tracking. Energy-collecting optics were optimized in Zemax OpticStudio with an effective focal length of 30 mm, a 25-mm entrance aperture (F/1.2), encircled energy above 90% within a 2.5-mm-diameter spot, and less than 1.5% on-axis power imbalance among the quadrants. Controlled defocus varied the spot radius from 1.0 to 3.4 mm to quantify the trade-off among angular sensitivity, linearity, and field of view. The normalized differential response was measured with an OCK collimator and rotary stage in 0.5° increments from 0° to 8°. Signals from all four quadrants were acquired with a four-channel PicoScope and processed in LabVIEW. Smaller spots produced a steeper near-axis response and higher peak values (0.96-0.97) but a narrower field of view, whereas larger spots extended angular coverage while reducing sensitivity and peak response to 0.894. The selected 1.6-mm-radius spot yielded the highest normalized peak response of 0.974 and the lowest RMS deviation of 0.046 from the theoretical model between 0° and 4°. Its measured half-angle field of view was 5.1° at a response threshold of 0.95 and 6.5° at a threshold of 0.77, demonstrating the dependence of usable angular range on the response criterion. Results show that experimental calibration is required to convert geometric field-of-view estimates into practical operating limits and guide defocus selection in QPD-based laser tracking systems.

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PI-25

SIZE-CONTROLLED FABRICATION AND OPTICAL PROPERTIES OF INKJET-PRINTED PVA/RHODAMINE B MICROSPHERES

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Abstract. Dye-doped polymer microspheres are attractive optical microcavities for photonic and sensing applications because of their simple geometry, tunable dimensions, and ability to support whispering-gallery modes (WGMs). However, conventional fabrication methods often provide limited control over microsphere size and reproducibility. Here, we demonstrate an inkjet-printing approach for the controlled fabrication of Rhodamine B (RhB)-doped polyvinyl alcohol (PVA) microspheres. Aqueous PVA solutions with concentrations ranging from 4 to 8 wt%, containing 1 wt% RhB, were ejected on demand from a MicroFab printhead directly into a polydimethylsiloxane (PDMS) matrix. The printed droplets formed highly spherical structures and were subsequently thermally treated at 100 °C for about 60 minutes to promote dehydration and solidification. The solid microspheres were then isolated from the PDMS matrix by washing with ethyl acetate. By varying the PVA concentration, the initial droplet volume and the shrinkage during solidification could be systematically controlled, resulting in reproducible variation of the final microsphere diameter. Under pulsed optical excitation, individual microspheres exhibited bright and spatially localized emission. Spectral measurements showed an evolution from broad spontaneous fluorescence at low excitation energies to narrow and intense resonant peaks in the 600–630 nm range at higher pump energies. These results demonstrate that inkjet printing provides a simple and potentially scalable approach for fabricating size-controlled dye-doped polymer microspheres with well-defined optical characteristics, offering potential for compact photonic sources and optical sensing applications.

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PI-26

ADVANCED OPTICAL SENSORS BASED ON PLASMONIC NANOMATERIALS FOR ENVIRONMENTAL MONITORING

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Abstract. The development of highly sensitive optical sensors is essential for monitoring environmental contaminants and ensuring public health. This work presents recent advances in plasmonic nanocomposite materials for surface-enhanced Raman scattering (SERS) and optical fiber sensing applications. Ag nanoparticle-decorated ZnO nanoflowers were successfully developed as efficient SERS substrates for pesticide detection, where the hierarchical nanostructure generated abundant plasmonic hot spots and enhanced analyte adsorption, enabling trace-level detection with excellent signal reproducibility. Furthermore, bimetallic Au–Ag nanoparticles were synthesized and integrated into both SERS substrates and localized surface plasmon resonance (LSPR)-based optical fiber sensors for sulfamethoxazole detection. The optimized Au–Ag nanostructures achieved a SERS limit of detection (LOD) of 5.42 nM with an analytical enhancement factor of 4.55×10^6 and signal variation below 5%, while the corresponding optical fiber sensor exhibited an LOD of 9.3×10^{-7} M with high measurement stability. These studies demonstrate that rational engineering of plasmonic nanocomposites significantly enhances localized electromagnetic fields and light–matter interactions, leading to remarkable improvements in sensitivity, selectivity, and stability. The combination of SERS and fiber-optic sensing provides a versatile platform for rapid, portable, and real-time detection of pesticides, antibiotics, and other environmental pollutants, offering promising opportunities for next-generation environmental monitoring and food safety applications.

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PI-27

STABLE SPACE OF THE DIELECTRIC NANOPARTICLE IN NONLINEAR OPTICAL TWEZERS

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Abstract. In this paper the stable space (SS) of dielectric nanoparticle (DNP) in the nonlinear optical tweezers (NOT) using the Gaussian laser beam is investigated. The nonlinear optical tweezers are proposed to use a air microscope objective (AMO) and positive nonlinear organic dye layer (PNODL) as an immersion oil. The focal length and waist radius of modified Gaussian depend on the input laser intensity. This feature is used to control the position and SS of nanoparticle. The expressions of the longitudinal and transverse optical forces as well as focal length are derived. And then the SS of dielectric nanoparticle in NOT is numerically observed. The capability to control the spatial position and SS space is discussed.

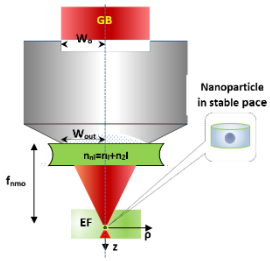

Fig. 1. *Sketch of NMO.*

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PI-28

DESIGN AND NUMERICAL INVESTIGATION OF A NOVEL Ce:LiCAF LASER CAVITY FOR TUNABLE DUAL-WAVELENGTH NARROW-LINEWIDTH UV EMISSION

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Abstract. Simultaneous generation of tunable dual-wavelength ultraviolet (UV) radiation is highly sought after for advanced applications such as continuous-wave Terahertz (THz) generation and precision spectroscopy. However, realizing this in a homogeneously broadened gain medium like Ce^{3+}:$LiCaAlF_6$ (Ce:LiCAF) is fundamentally hindered by severe mode competition. In this paper, we present the design and numerical investigation of a novel dual-wavelength laser cavity based on a Ce:LiCAF crystal pumped by the 266 nm fourth harmonic of an Nd:YAG laser. The proposed cavity architecture employs dual diffraction grating branches to independently select and narrow the emission linewidths within the broad gain bandwidth. By employing a multi-wavelength rate equation system, we demonstrate the emission characteristics of a laser simultaneously generating two narrow-band, continuously tunable outputs in the 280–320 nm range with a spectral linewidth of approximately 5 pm. Furthermore, the mode competition effect between the emission branches is systematically evaluated. Our simulation results validate the feasibility of achieving stable, synchronized dual-wavelength emission. This study provides optimized optical parameters and cavity design guidelines, offering a robust platform for developing compact, tunable, and narrow-linewidth dual-wavelength UV solid-state lasers.

Keywords: Ce:LiCAF crystal, Ultraviolet solid-state laser, narrow-linewidth laser, tunable laser.

PI-29

OPTICAL BISTABILITY IN A FOUR-LEVEL CASCADE-TYPE ATOMIC SYSTEM

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Abstract. Optical bistability (OB) is an important nonlinear optical phenomenon with potential applications in optical switching, optical memories, optical logic gates, and all-optical signal processing [1]. The threshold intensity and width of the bistable region are key parameters determining the operating characteristics of OB-based optical devices. Electromagnetically induced transparency (EIT) provides an effective approach for controlling optical nonlinearities and, consequently, the bistable response of atomic media [2,3]. OB has been extensively investigated in three-level lambda-, V-, and ladder-type atomic systems, where the bistable behavior can be controlled through the intensity and detuning of the applied laser fields [4-8]. More recently, multilevel atomic systems have been studied to obtain enhanced and tunable optical bistability [9-12].

In this work, we investigate the formation and control of optical bistability in a four-level cascade-type atomic system. The dependence of the OB response on the coupling-field intensity, probe-field detuning, and other relevant laser parameters is systematically investigated. We demonstrate that the bistable threshold and the width of the hysteresis loop can be effectively controlled by the applied optical fields. The results indicate that the four-level cascade-type atomic system provides a suitable platform for realizing controllable optical bistability for nonlinear optical applications.

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PI-30

COMPARATIVE ANALYSIS OF THE EFFECTIVE MODE AREA IN PBG-08 GLASS SUSPENDED-CORE FIBERS WITH AIR-FILLED AND Cs2-INFILTRATED CONFIGURATIONS

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Abstract. This paper presents a numerical study of the effective mode area (A_{eff}) of a suspended-core fiber (SCF) made of PBG-08 glass. Two configurations are considered in the study, including air-filled holes and holes infiltrated with carbon disulfide (CS_2). The finite element method is used to calculate the modal properties over the near and mid-infrared wavelength ranges for different values of the structural parameter. The results show that the use of CS_2 in the air holes leads to an increase in the effective mode area. This behavior is mainly related to the higher refractive index of CS_2 compared with air, which decreases the refractive-index difference between the core and cladding. As a result, the optical field is less confined to the suspended-core and extends further into the surrounding region. For all investigated wavelengths, the CS_2-infiltrated configuration exhibits a larger effective mode area than the air-filled configuration. The obtained results can be useful for designing liquid-infiltrated suspended-core fibers with controlled nonlinear optical properties.

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PI-31

PROPAGATION CHARACTERISTICS AND DISPERSION PROPERTIES OF As_2Se_3 SUSPENDED-CORE FIBERS WITH VARYING BRIDGE-TO-CORE RATIO

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Abstract. This study investigates the propagation characteristics of a suspended-core fiber based on As_2Se_3 glass with three microstructured holes infiltrated with carbon disulfide, with the aim of exploring its potential for supercontinuum generation in the infrared region. The influence of the geometric parameter η, defined as the ratio of the bridge width to the core radius, is investigated over the range from 0.5 to 0.7 using numerical simulations. Based on the effective refractive index, the propagation constant, and group velocity, group-velocity dispersion parameter is determined and analyzed as functions of wavelength. The results demonstrate that variations in η significantly modify the modal propagation and dispersion characteristics of the fiber. Among the investigated configurations, the structure with $\eta = 0.7$ exhibits two zero-dispersion wavelengths and favorable group-velocity dispersion profile in the relevant spectral region. This favorable dispersion characteristic is expected to provide enhanced phase matching and efficient nonlinear spectral broadening, making this fiber a promising candidate for supercontinuum generation. These results demonstrate that the bridge-to-core geometrical ratio can effectively tailor the propagation and dispersion characteristics of liquid-infiltrated suspended-core fibers. The resulting control over the fiber properties makes the proposed structure promising for broadband supercontinuum generation in the mid-infrared region.

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PI-32

INFLUENCE OF NOMINAL pH ON STRUCTURE, MORPHOLOGY, OPTICAL AND PHOTOCATALYTIC PROPERTIES OF TiO_2

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Abstract. TiO_2 powders were synthesized by a co-precipitation method at nominal pH values of 2, 4, 6, 8, and 10 and calcined at 400 ºC. The influence of nominal pH on the structure, morphology, pore characteristics, optical properties, and photocatalytic activity of TiO_2 was investigated by XRD, Raman spectroscopy, SEM, N_2 adsorption-desorption, and UV-Vis absorption measurements. The results show that all samples are mainly anatase with weak features attributable to brookite. The 10-TiO_2 sample exhibits the narrowest main XRD peak and a clearly different Raman response after calcination. The BET results show that 8-TiO_2 has the highest specific surface area, whereas 10-TiO_2 has the largest pore volume and average pore width. The photocatalytic activity was evaluated through the degradation of 20 ppm methylene blue (MB) under Xenon lamp irradiation. Among the investigated samples, 10-TiO_2 exhibits the highest photocatalytic activity, with a degradation efficiency of 96.33% after 180 min and an apparent rate constant of 0.01761 min^{-1}. This result suggests that the high photocatalytic activity of 10-TiO_2 cannot be explained by the specific surface area or absorption edge alone and may be related to its structural and pore characteristics.

Keywords: TiO_2, co-precipitation , pH, photocatalytic activity, MB.

PI-33

CONCENTRATION- AND SOLVENT-DEPENDENT FLUORESCENCE PROPERTIES OF AMPHOTERICIN B FOR POTENTIAL PHOTOSENSITIZER APPLICATIONS

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Abstract. Amphotericin B (AmB) is a polyene antifungal compound with an extended conjugated system that exhibits characteristic optical properties. In this study, the fluorescence properties of AmB were investigated as a function of concentration and solvent environment to evaluate its potential application as a photosensitizer. AmB samples with nominal concentrations of 5, 10, 25, 50, and 100 μg/mL were prepared in ethanol and dimethyl sulfoxide (DMSO). Fluorescence emission spectra were recorded at an excitation wavelength of 350 nm. Both solvent systems exhibited broad emission bands in the visible region, with emission maxima at approximately 467–470 nm in ethanol and 471–472 nm in DMSO. The fluorescence intensity increased significantly with increasing AmB concentration in both solvent systems. After solvent-blank correction, the ethanol system exhibited higher fluorescence intensities at concentrations of 5–25 μg/mL, whereas the fluorescence responses of the two systems became comparable at 50 μg/mL. At higher concentrations, the increase in fluorescence intensity was less pronounced in ethanol, while the DMSO system retained a stronger concentration-dependent response. In addition, the excitation spectrum of the 25 μg/mL AmB sample in ethanol exhibited a strong near-ultraviolet response, with a principal maximum at approximately 334 nm and another prominent excitation region near 350–352 nm, supporting the selection of 350 nm as the excitation wavelength for fluorescence measurements. These results demonstrate that the fluorescence behavior of AmB is strongly influenced by both concentration and solvent environment. The pronounced near-ultraviolet excitation and visible fluorescence response provide a spectroscopic basis for further investigation of AmB as a potential photosensitizing agent in light-assisted antifungal applications

Keywords: Amphotericin B; fluorescence; DMSO; ethanol; photosensitizer; near-UV; light-assisted antifungal application.

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PI-34

EFFECTS OF pH AND Eu^{3+} DOPING ON THE STRUCTURE, MORPHOLOGY, AND OPTICAL PROPERTIES OF $BiVO_4$

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Abstract. Bismuth vanadate ($BiVO_4$) is a metal oxide semiconductor whose crystal structure, morphology, and optical properties are strongly dependent on synthesis conditions and dopant composition. In this study, $BiVO_4$ was synthesized at different pH values and doped with various Eu^{3+} concentrations to investigate the effects of reaction pH and Eu^{3+} incorporation on the crystal structure, microstructure, and photoluminescence properties of the material. The obtained samples were characterized by X-ray diffraction (XRD), field-emission scanning electron microscopy (FE-SEM), and photoluminescence spectroscopy. XRD results showed that pH strongly influenced the phase formation of $BiVO_4$. At pH 3, highly crystalline monoclinic scheelite $BiVO_4$ was preferentially formed, whereas strongly acidic conditions at pH 1 favored the tetragonal zircon phase. Eu^{3+} doping at pH 3 induced a structural transition from monoclinic to tetragonal $BiVO_4$ even at low Eu^{3+} concentrations. FE-SEM observations revealed that changes in pH significantly affected particle morphology and aggregation. Increasing the Eu^{3+} content from 1 to 5% transformed the initial coral-like morphology into more well-defined rod-like and polyhedral structures, with the 5% Eu^{3+}-doped sample exhibiting the most developed morphology. At higher Eu^{3+} concentrations of 7–9%, increased aggregation and structural fragmentation were observed. Notably, the photoluminescence spectrum of Eu^{3+}-doped $BiVO_4$ under 310 nm excitation exhibited characteristic Eu^{3+} emission bands in the approximately 590–630 nm region, with dominant red emission around 610–620 nm, associated with the $^5D_0$-^7F_J transitions. These results demonstrate that Eu^{3+} doping not only modifies the crystal structure and morphology of $BiVO_4$ but also introduces characteristic rare-earth photoluminescence behavior.

***Keywords**:* $BiVO_4$; europium; Eu^{3+} doping; pH; XRD; FE-SEM; crystal structure.

PI-35

SYNTHESIS, INVESTIGATION OF OPTICAL PROPERTIES OF TiO_2 NANOROD COMPOSITES FOR OPTOELECTRONIC APPLICATIONS

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Abstract. TiO_2 nanorod composites were synthesized using a hydrothermal approach combined with wet impregnation and followed by post-annealing. The obtained composites exhibit a nanorod diameter of 110-130 nm and length of 1-1.3 μm. They are composed of anatase TiO_2, hematite α-Fe_2O_3, and cubic fluorite CeO_2 phases with good crystallinity. Optical characterization reveals that the incorporation of Fe_2O_3 and CeO_2 reduces the optical bandgap from 3.72 to 2.94 eV, leading to enhanced visible-light absorption. FTIR spectra confirm the presence of (Ti, Fe and Ce)-O bonds. At the same time, spectral photoluminescences show emission bands in the 400-600 nm range, indicating efficient electronic transitions and good crystalline quality. The results indicated that the $TiO_2/Fe_2O_3/CeO_2$ nanorod composites possess favorable structural and optical characteristics for optoelectronic devices.

PI-36

EFFECT OF CO INCORPORATION ON THE STRUCTURAL, OPTICAL, AND PHOTOCATALYTIC PROPERTIES OF $CuO/Zn_{1-x}Co_xO$ NANOCOMPOSITES

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Abstract. $CuO/Zn_{1-x}Co_xO$ nanocomposites with different cobalt concentrations (x = 0, 0.01, 0.03, 0.05, 0.07, and 0.10) were synthesized using a precipitation-based route to investigate the influence of Co incorporation on their structural, morphological, optical, and photocatalytic properties. X-ray diffraction analysis confirmed the coexistence of ZnO and CuO crystalline phases, while composition-dependent variations in diffraction peak characteristics and lattice parameters indicated structural modification with increasing Co content. Raman and Fourier-transform infrared spectroscopy further revealed changes in the local vibrational and metal-oxygen bonding environments. Scanning electron microscopy showed nanoscale particle agglomerates with a pronounced dependence of particle size on Co concentration. In particular, the x = 0.05 sample exhibited the smallest average particle size of approximately 38.3 nm. UV–Vis spectroscopy revealed that Co incorporation modified the optical response and reduced the estimated optical band gap from approximately 3.34 eV for the undoped composite to around 3.30 eV for the Co-containing samples. Photocatalytic measurements using a model organic dye demonstrated a strong composition-dependent activity. Among the investigated samples, $CuO/Zn_{0.95}Co_{0.05}O$ exhibited the highest photocatalytic performance, reaching approximately 98% degradation within 30 min and an apparent pseudo-first-order rate constant of approximately 0.116 min^{-1}. Further increasing the Co concentration resulted in a marked decrease in photocatalytic activity. These results demonstrate that an intermediate Co concentration provides an optimum balance among structural modification, particle morphology, and optical characteristics, highlighting $CuO/Zn_{0.95}Co_{0.05}O$ as the most promising composition for photocatalytic applications.

PI-37

COBALT INDUCED MODULATION OF STRUCTURAL AND PHOTOCATALYTIC PROPERTIES IN $Cu_2O/Zn_{1-x}Co_xO$ HETEROSTRUCTURES

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Abstract. Engineering the composition and interfacial characteristics of oxide heterostructures provides an effective route for tailoring their physicochemical and photocatalytic properties. In this work, $Cu_2O/Zn_{1-x}Co_xO$ heterostructures with Co contents of x = 0, 0.01, 0.03, and 0.05 were prepared and systematically investigated to elucidate the role of Co incorporation in the coupled Cu_2O/ZnO system. X-ray diffraction confirmed the simultaneous presence of cubic Cu_2O and hexagonal wurtzite ZnO, while the composition-dependent evolution of lattice parameters and diffraction profiles indicated progressive modification of the crystalline structure. The average crystallite size estimated from XRD decreased markedly with increasing Co concentration, from approximately 20 nm for the undoped sample to about 13 nm at x = 0.05. Raman and FTIR spectroscopy further evidenced variations in the local vibrational and metal-oxygen bonding environments. Electron microscopy revealed strongly composition dependent particle growth, with average particle sizes ranging from approximately 48 to 125 nm. Optical measurements demonstrated that Co incorporation altered both the Cu_2O and ZnO related optical responses, with estimated band-gap energies varying in the ranges of approximately 2.52-2.54 eV and 3.29-3.34 eV, respectively. The photocatalytic behavior exhibited a pronounced dependence on Co content. Although all compositions showed substantial degradation under irradiation, the $Cu_2O/Zn_{0.95}Co_{0.05}O$ sample displayed the fastest reaction kinetics, with an apparent pseudo-first-order rate constant of approximately 0.137 min^{-1} and nearly complete pollutant removal within 40 min. The results highlight the importance of controlled Co incorporation in regulating the structural and optical characteristics of Cu_2O/ZnO heterostructures and demonstrate that x = 0.05 provides the most favorable composition for enhanced photocatalytic performance.

PI-38

EFFECT OF METAL DOPING AND THERMAL TREATMENT ON THE STRUCTURE, SPECTROSCOPIC PROPERTIES, AND PHOTOCATALYTIC ACTIVITY OF Cu_2O

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Abstract. This study investigates the effects of metal doping and thermal treatment on the structural, spectroscopic, and photocatalytic properties of Cu_2O. Undoped and Fe-, Ni-, Zn-, and NiFeZn-doped Cu_2O samples were synthesized and characterized by X-ray diffraction (XRD), field-emission scanning electron microscopy (FE-SEM), Raman spectroscopy, and UV–Vis absorption spectroscopy. XRD results confirmed that all samples retained the cubic Cu_2O phase after doping, while the crystallite size and microstrain varied significantly, ranging from 11 to 58 nm and from 0.4×10^{-3} to 3.8×10^{-3}, respectively. FE-SEM observations revealed that the particles were formed by the aggregation of numerous crystallites into spherical structures with sizes of approximately 230–380 nm, with noticeable morphological changes induced by metal doping. Raman spectra exhibited characteristic vibrational modes of cubic Cu_2O, while variations in the relative intensities of the E_u and T_{2u} modes indicated changes in the local defect structure. UV–Vis spectra showed the characteristic absorption edge of Cu_2O together with an extended absorption tail toward the near-infrared region, particularly pronounced for Ni-doped Cu_2O. The apparent optical band gap values were in the range of 2.16–2.23 eV. Under UV irradiation, all samples exhibited significant photocatalytic activity, with Ni-doped Cu_2O showing the highest reaction rate constant of 0.03818 min^{-1}. Furthermore, thermal treatment of Cu_2O at 100–150 °C promoted the oxidation of Cu to Cu_2O without significantly altering the crystallite size or particle morphology, while progressively enhancing the photocatalytic degradation efficiency. The sample treated at 150 °C exhibited the highest photocatalytic performance. These results demonstrate that metal doping and thermal treatment can effectively modulate the structural defects and spectroscopic characteristics of Cu_2O, thereby influencing its photocatalytic activity.

PI-39

EFFECTS OF CDOTS ON THE STRUCTURAL AND SPECTROSCOPIC PROPERTIES OF ZnO/Cu_2O NANOCOMPOSITES

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Abstract. This study investigates the structural, morphological, optical, and photocatalytic properties of Cdots-modified ZnO/Cu_2O nanocomposites with Cdots contents ranging from 0.33 to 1.64%, corresponding to 1–5 mL of Cdots precursor. Cdots were introduced at an early stage of the synthesis by a temperature-assisted coprecipitation method, aiming to promote their incorporation and surface coverage on the ZnO/Cu_2O composite. The prepared materials were systematically characterized using X-ray diffraction (XRD), field-emission scanning electron microscopy (FE-SEM), Raman spectroscopy, UV–Vis absorption spectroscopy, and photoluminescence (PL) spectroscopy. XRD results confirmed the coexistence of cubic Cu_2O and hexagonal ZnO phases in all composites. Increasing Cdots content affected the crystal structure of the ZnO/Cu_2O composite, as evidenced by changes in the lattice parameters and a reduction in the Zn–O bond length. UV–Vis analysis revealed a gradual narrowing of the optical band gap of ZnO from approximately 3.4 to 3.1 eV with increasing Cdots content, whereas the band gap of Cu_2O remained nearly unchanged. The Cdots-modified ZnO/Cu_2O composite containing 1 mL of Cdots exhibited the highest photocatalytic performance, achieving 95.6% degradation of Rhodamine B within 50 min under mercury-lamp irradiation. The optimized composite also showed considerable photocatalytic activity toward ciprofloxacin, with hydroxyl radicals identified as important reactive species in the pollutant degradation process. Notably, the photocatalytic performance decreased progressively with increasing Cdots content beyond the optimum concentration, indicating that excessive Cdots incorporation can adversely affect the photocatalytic process. These results demonstrate that an appropriate Cdots concentration can effectively modulate the structural and optical properties of ZnO/Cu_2O nanocomposites and enhance their photocatalytic performance.

PI-40

MLP SURROGATE-ASSISTED OPTIMIZATION OF BRAGG MIRRORS WITH REDUCED INTERFACE ELECTRIC-FIELD INTENSITY FOR HIGH-POWER LASER APPLICATIONS

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Abstract. This paper presents an AI-assisted optimization method for high-power Bragg mirrors by combining a Multilayer Perceptron (MLP) surrogate model with the Differential Evolution algorithm. A 24-layer HfO_2/SiO_2 mirror operating at 1064 nm was investigated, with only the four outermost layers selected as optimization variables. The MLP was trained using 8,000 Transfer Matrix Method (TMM) simulations and achieved R^2 scores of 0.9867 for reflectivity and 0.9337 for the maximum normalized interface electric-field intensity. The optimized design was obtained in 4.04 s, reducing the interface electric-field intensity from approximately 0.95 to 0.448 while maintaining a reflectivity above 99.9%. TMM verification confirmed the prediction accuracy. The proposed framework provides a fast and physically reliable approach for AI-assisted optimization of high-power dielectric mirrors.

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PI-41

MULTIBAND THERMAL CAMOUFLAGE ENABLED BY BAYESIAN-OPTIMIZED METAMATERIAL EMITTERS

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Abstract. Thermal infrared camouflage requires suppressing radiation within atmospheric detection windows while maintaining effective heat dissipation. This work presents a Bayesian-optimized, molecularly assisted metal–dielectric–metal (MDM) metamaterial emitter for selective thermal radiation control. The structure consists of an Al disk resonator, a polyimide spacer, and an Al ground plane. Bayesian optimization coupled with full-wave simulations is employed to minimize emissivity in the 8–14 μm LWIR detection band while enhancing emission in the 5–8 and 14–20 μm non-detection bands. The optimized design maintains a low band-averaged emissivity of approximately 0.04 in the LWIR window over 250–400 K. Comparison with a constant-permittivity MDM model and a free-standing polyimide film suggests that the molecular dispersion of polyimide contributes to the enhanced multiresonant emission outside the detection band. Radiative-power analysis further shows that the two non-detection bands provide complementary heat-dissipation channels across the investigated temperature range. These results demonstrate the potential of combining molecularly active dielectrics with Bayesian optimization for passive LWIR camouflage and thermal management.

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PI-42

FACILE SYNTHESIS OF METHYLAMMONIUM LEAD IODIDE PEROVSKITE NANOWIRES VIA A TWO-STEP DISSOLUTION-RECRYSTALLIZATION METHOD

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Abstract. Methylammonium lead iodide ($MAPbI_3$) perovskite nanowires have become one of the most promising materials for use in electrical and optoelectronic devices. Understanding crystal growth and improving the material quality of these structures are important for improving semiconductors for their applications, and it is still challenging. In this study, we report the synthesis of methylammonium lead iodide perovskite nanowires by a two-step dissolution-recrystallization method. The $Pb(Ac)_2$ film was prepared by drop-casting a solution of $Pb(CH_3COO)_2$ ($Pb(Ac)_2$) in N, N-dimethylformamide ($(CH_3)_2NC(O)H$ (DMF). The $MAPbI_3$ film was fabricated by converting $Pb(Ac)_2$ film in the methylammonium iodide (CH_3NH_3I: MAI) solution. The structure and morphology of the as-synthesised material were confirmed using X-ray diffraction spectroscopy (XRD) and field emission scanning electron microscopy (FE-SEM). Different morphologies, including cuboids and nanowires, were obtained through the solvent control. The solvent in the seed grains seems to have a significant impact on the morphology of these nanostructures, including the aspect ratio and growth direction. These results imply that carefully controlling nucleation, dissolution, and growth dynamics during the two-step process allows for the tailoring of the perovskite nanostructures' morphology and aspect ratio. Finally, the growth mechanism of the $MAPbI_3$ nanowires was also discussed. Understanding these mechanisms is crucial for optimizing the performance of perovskite-based devices.

Keywords: $MAPbI_3$; nanowires; halide perovskite; two-step process; formation mechanism.

PI-43

FACILE FABRICATION OF BiI_3 NANOPLATES FOR HIGHLY SELECTIVE NO_2 GAS SENSING AT ROOM TEMPERATURE

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Abstract. This study aims to develop BiI_3 thin films for gas sensing applications operating at room temperature without external light illumination. The BiI_3 films were successfully synthesized via a chemical vapor deposition (CVD) method, with an average nanoplate thickness of approximately 20 nm. The BiI_3-based sensor exhibits high selectivity toward NO_2 gas at ppm-level concentrations, along with a significant sensing response and fast response/recovery characteristics. In addition, the sensor achieves a low limit of detection (LOD) of approximately 50 ppb for NO_2, indicating its capability for detecting trace gas concentrations. These results demonstrate that BiI_3 is a promising material for room-temperature gas sensing applications.

Keywords: BiI_3; nanoplates; NO_2 gas-sensing; room temperature; CVD.

PI-44

SUPERCONTINUUM GENERATION IN ETHANOL-INFILTRATED FOUR-HOLE SUSPENDED-CORE FIBERS

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Abstract. We present a comprehensive numerical investigation of supercontinuum (SC) generation in a four-hole suspended-core fiber (SCF) infiltrated with ethanol. The infiltration of ethanol into the air holes of the SCF enables precise dispersion engineering without modifying the fiber geometry, shifting the dispersion characteristics toward the all-normal dispersion regime. Using the generalized nonlinear Schrödinger equation (GNLSE), we simulate SC generation under femtosecond pulse pumping at 1064 nm. The ethanol-filled SCF with a 2.2 μm core diameter operates in the all-normal dispersion region, generating a flat and coherent SC spectrum spanning from 717 nm to 1700 nm at a peak power of 30 kW and pulse width of 50 fs. Our results demonstrate that ethanol infiltration provides an experimentally accessible and effective approach for dispersion control in SCFs, enabling the generation of smooth, noise-free SC spectra with excellent coherence properties. The four-hole geometry offers enhanced light confinement and nonlinearity, making it a promising platform for compact infrared SC sources. These findings provide new insights into liquid-infiltrated suspended-core fibers for nonlinear photonic applications.

Keywords: Supercontinuum generation, suspended-core fiber, four-hole fiber, ethanol infiltration, all-normal dispersion, nonlinear optics, photonic crystal fiber.

PI-45

SYNTHESIS AND NEAR-INFRARED PHOTOLUMINESCENCE PROPERTIES OF Cr^{3+}-DOPED Zn_2SnO_4 PHOSPHOR

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Abstract. Cr^{3+}-doped Zn_2SnO_4 phosphors exhibiting far-red to near-infrared emission were synthesized by the solid-state reaction method. The effects of sintering temperature and Cr^{3+} concentration on the phase structure, morphology, and photoluminescence properties were systematically investigated. A pure single-phase material was obtained after sintering at 1250 ^oC, with particle sizes ranging from 1 to 4 µm. The photoluminescence excitation spectrum exhibited characteristic bands at 280, 310, and 445 nm, which were associated with Cr^{3+}-related electronic transitions. Upon suitable excitation, a broad far-red to near-infrared emission band extending from 650 to 850 nm was observed, with emission maxima at 703 and 730 nm, attributed to the $^2E \rightarrow {}^4A_2$ and $^4T_2 \rightarrow {}^4A_2$ transitions of Cr^{3+}, respectively. The emission intensity reached a maximum at a Cr^{3+} concentration of 1% and a sintering temperature of 1250 ^oC. These results indicate that Cr^{3+}-doped Zn_2SnO_4 is a promising far-red phosphor with potential applications in agricultural LED lighting for promoting plant flowering.

PI-46

EFFECT OF Eu^{3+} CONCENTRATION ON THE OPTICAL PROPERTIES AND JUDD-OFELT PARAMETERS OF $MgAl_2O_4:Eu^{3+}$ PHOSPHORS

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Abstract. $MgAl_2O_4:Eu^{3+}$ phosphors were synthesized via the solid-state reaction method with Eu^{3+} doping concentrations ranging from 1 to 5 mol%, sintered at 1300 °C in air. Structural analysis confirmed that the synthesized materials possess the characteristic spinel structure of $MgAl_2O_4$ (space group *Fd-3m*) with an average particle size of 1–2 μm. The crystal structure remained virtually unchanged with increasing Eu^{3+} concentration. The materials exhibit strong absorption in the near-ultraviolet and blue regions, resulting in intense red emission with a color purity exceeding 92%. The photoluminescence intensity increased with Eu^{3+} concentration, with concentration quenching observed at 4 mol% Eu^{3+}. Analysis of Judd-Ofelt optical parameters indicated a slight increase in the Ω_2 and Ω_4 values as the Eu^{3+} concentration rose, suggesting that higher Eu^{3+} concentrations enhance the crystal field asymmetry around the Eu^{3+} ions. Furthermore, the materials demonstrate high thermal stability and an internal quantum efficiency exceeding 67%. These results indicate their strong potential for application as red emitters in white LEDs and specialized agricultural lighting.

PI-47

SELF-BROADENED LINE-SHAPE PARAMETERS OF CO_2 LINES AT ROOM TEMPERATURE

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Abstract. Our recent work (J. Quant. Spectrosc. Radiat. Transf. **347**, 109596, 2025) has recommended the modified Hartmann–Tran profile (mHTp) as the new reference profile for spectral interpretation and modeling. To predict the line-shape parameters of self-broadened CO_2 lines at room temperature, we performed requantized Classical Molecular Dynamics Simulations (rCMDS) of self-broadened CO_2 at 296 K. The calculations were carried out using a simple Lennard-Jones potential with parameters taken from Murthy (Molecular Physics **44**, 1981, 135–143) for a large number of active molecules (110×10^6) and for various Doppler widths, enabling the calculation of absorption spectra over a wide range of collisional-to-Doppler width ratios. The obtained spectra were then fitted using different profiles, the Voigt profile, the speed-dependent Voigt profile, and the mHTp. The corresponding retrieved parameters are compared with available experimental data, and their agreement is discussed

Keywords: CO_2, modified Hartmann-Tran, Voigt, speed dependent Voigt.

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PI-48

NEW LINE-SHAPE PARAMETERS OF CO LINES BROADENED BY AIR AT ROOM TEMPERATURE

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Abstract. The Hartmann-Tran profile (HTp) has been recommended as a reference profile for the most accurate spectral interpretations and modeling. However, some practical issues with the HTp have subsequently been revealed. Therefore, our recent work (J. Quant. Spectrosc. Radiat. Transf. **347**, 109596, 2025) has recommended a modified Hartmann-Tran profile (mHTp) as the new reference profile for applications. In this work, we predict the line-shape parameters for CO lines broadened by air at room temperature corresponding to the mHTp. To this end, we performed Classical Molecular Dynamics simulations of CO diluted in air. The calculations were performed at room temperature (296 K) for a large number of active molecules (120×10^6) and for various Doppler widths, enabling the calculation of absorption spectra over a large range of collisional-to-Doppler width ratios. The obtained spectra were then fitted using the mHTp, providing the corresponding line-shape parameters. The predicted parameters are compared with available experimental data, and their agreement is discussed.

Keywords: CO, modified Hartmann-Tran, refined line-shape parameters.

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PI-49

ELECTRONIC STRUCTURE, VISIBLE-LIGHT RESPONSE AND PHOTO-FENTON ACTIVITY OF A 16-COMPONENT ULTRA-HIGH-ENTROPY RARE-EARTH ORTHOFERRITE

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Abstract. Ultra-high-entropy oxides provide a promising platform for tailoring the electronic and optical properties of functional materials through extensive compositional disorder. In this work, a 16-component ultra-high-entropy rare-earth orthoferrite, Σ*RE*FeO_3 (*RE* = Sc, Y, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, and Lu), was investigated as a visible-light-responsive photo-Fenton material. Structural characterization confirmed the formation of a single-phase orthorhombic perovskite-type structure with an average crystallite size of approximately 32 nm. X-ray photoelectron spectroscopy revealed a complex surface electronic structure involving predominantly trivalent rare-earth cations, mixed Fe^{3+}/Fe^{2+} states, and oxygen-defect-related species. Diffuse reflectance spectroscopy demonstrated broad absorption in the visible spectral region, with an experimental optical band gap of 2.26 eV. Electronic-structure calculations indicated that the states near the band edges are mainly associated with Fe–O hybridization and rare-earth-derived electronic states, with a calculated direct band gap of 1.38 eV. Under visible-light irradiation in the presence of H_2O_2, Σ*RE*FeO_3 exhibited photo-Fenton activity toward methyl violet degradation. The combination of visible-light absorption, Fe redox chemistry, oxygen-defect-related surface states, and extensive A-site compositional complexity highlights ultra-high-entropy rare-earth orthoferrites as a promising class of photoactive materials for advanced oxidation processes [1,2].

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PI-50

ELECTROMAGNETICALLY INDUCED TRANSPARTENCY IN AN ASYMMETRIC FOUR-LEVEL N-TYPE Cs ATOMIC SYSTEM

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Abstract. Electromagnetically induced transparency (EIT) is a coherent quantum-interference phenomenon that allows a weak probe field to propagate through an atomic medium with strongly reduced absorption in the presence of a control field [1-3]. EIT has attracted considerable interest because of its applications in slow and fast light, nonlinear optics, optical switching, optical communications, and quantum information processing [4].

EIT has been extensively studied in three-level lambda-, ladder-, and V-type systems. More recently, multilevel configurations have received increasing attention because they provide additional possibilities for generating and controlling multiple transparency windows [4]. In particular, EIT in cesium (Cs) atoms has been investigated in both low-lying-state and Rydberg-state systems, with applications in coherent optical control, microwave and electric-field sensing, and quantum technologies [5-7].

In this work, we investigate EIT in an asymmetric four-level N-type Cs atomic system. Using the density-matrix formalism, analytical expressions for the probe coherence, absorption, and dispersion are derived. The influence of the coupling-field parameters and the asymmetry of the optical transitions on the EIT spectrum is systematically studied. The results provide insight into the coherent optical response of multilevel Cs atoms and may be useful for developing Cs-based quantum optical systems.

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PI-51

COLOSSAL CROSS-KERR NONLINEARITY IN A FOUR-LEVEL CASCADE-TYPE ATOMIC SYSTEM

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Abstract. Kerr optical nonlinearity plays an important role in nonlinear and quantum optics, with applications in optical switching, cross-phase modulation, quantum information processing, and quantum nondemolition measurements [1]. Among different Kerr effects, the cross-Kerr nonlinearity, in which the intensity of one optical field modifies the phase of another, is of particular interest for realizing strong interactions between optical fields.

Electromagnetically induced transparency (EIT) provides an effective approach for enhancing optical nonlinearities while simultaneously suppressing absorption near atomic resonance [2]. Large cross-Kerr nonlinearities have been demonstrated or theoretically predicted in several multilevel atomic configurations, including N-type [3], M-type [4], inverted-Y-type [5], and tripod-type systems [6-8]. These studies demonstrate that suitable atomic-level configurations and coherent optical interactions can significantly enhance the nonlinear optical response. More recently, giant cross-Kerr nonlinearity at multiple frequencies in a six-level inverted-Y atomic system has proposed [9].

In this work, we investigate the cross-Kerr nonlinearity in a four-level cascade-type atomic system. Using the density-matrix formalism, the optical coherence is obtained and expanded in a Taylor series with respect to the intensity of the signal field. From this expansion, the third-order nonlinear susceptibility responsible for the cross-Kerr effect is derived. We then investigate the dependence of the third-order nonlinear susceptibility and the corresponding cross-Kerr nonlinear coefficient on the relevant optical-field parameters. Our results show that the EIT mechanism can produce a colossal cross-Kerr nonlinear coefficient with strongly suppressed absorption, providing a promising platform for enhanced nonlinear optical interactions and potential applications in all-optical switching and quantum optical technologies.

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PI-52

AgAu NANOPARTICLES-ENRICHED ZnO NANOPLATES AS A SERS SUBSTRATE FOR THE SENSITIVE DETECTION OF METHYLENE BLUE

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Abstract. In this report, we utilized a simple and facile deposition method to decorate silver/gold nanoparticles (AgAu NPs) on zinc oxide nanoplates (ZnO NPls) for a sensitive SERS detection of methylene blue (MB). The obtained ZnO/AgAu-based SERS substrate exhibited outstanding SERS performance with the limit of detection (LOD) of 10^{-8} M and enhancement factor (EF) of 7.88×10^{6}. The finding indicates the potential ability of the proposed SERS material for trace detection of MB for environmental controlling.

***Keywords*:** SERS, ZnO/AgAu, methylene blue, environmental monitoring.

SESSION POSTER II

PII-01

HIGH PRECISION EXOPLANET TRANSIT PHOTOMETRY WITH A 0.5 m TELESCOPE: TECHNIQUES, DATA REDUCTION, AND PILOT OBSERVATIONS

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Abstract. This study aims to assess the performance and practical limitations of transit photometry using modest-aperture astronomical instrumentation under observational conditions affected by atmospheric variability, light pollution, and other practical constraints. Observations were obtained with a 0.5-m Ritchey–Chrétien telescope equipped with a ZWO ASI2600MM Pro camera. We developed a reduction and photometric pipeline incorporating image calibration, background estimation, source detection and characterization, aperture photometry, local sky estimation, uncertainty propagation, frame-to-frame source tracking, differential flux construction, and Bayesian transit modeling. The transit modeling procedure uses the batman transit model combined with Markov-chain Monte Carlo sampling to estimate transit parameters and their associated uncertainties. The analysis pipeline was applied to several exoplanet transit targets, including NGTS-10b, TOI-3127.01, and TOI-3547.01, providing a basis for assessing the performance, robustness, and limitations of the observational and data-reduction procedures across targets with different observational characteristics. These results demonstrate the feasibility of conducting quantitative exoplanet transit photometry with a modest-aperture telescope while identifying the observational and systematic limitations that must be addressed to achieve more precise measurements.

PII-02

ENERGY TRANSFER PROCESS IN Ce^{3+}/Tb^{3+} CO-DOPED BARIUM MAGNESIUM SILICATE PHOSPHORS

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Abstract. The luminescent $Ba_2MgSi_2O_7$ (BMS) materials singly doped with Ce^{3+}, Tb^{3+}, and co-doped with Ce^{3+}/Tb^{3+} were successfully fabricated by the solid-state reaction method. The crystal structure, surface morphology, chemical composition, and luminescence properties of the prepared samples were investigated using X-ray diffraction (XRD), scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDS), photoluminescence excitation (PLE) spectra, photoluminescence (PL) spectra, and CIE chromaticity coordinates. The XRD results confirmed that all obtained samples exhibited a single-phase $Ba_2MgSi_2O_7$ crystal structure without detectable impurity phases. The SEM observations revealed that the particles were non-uniformly distributed, while the EDS analysis confirmed the presence of the doped rare-earth elements in the samples. Analysis of the PL and PLE spectra revealed a good spectral overlap between the emission spectrum of Ce^{3+} and the excitation spectrum of Tb^{3+}, indicating the possibility of energy transfer from Ce^{3+} to Tb^{3+} whey they were co-doped into the BMS host lattice. A comparison of the PLE spectra of the Tb^{3+} -singly doped and Ce^{3+}/Tb^{3+}-co-doped samples, together with the fluorescence lifetime measurements of Ce^{3+}, further confirmed the occurrence of this energy transfer process, which contributed to the enhancement of the Tb^{3+} emission intensity. The CIE chromaticity coordinates demonstrated that the emission color of the BMS materials could be turned from blue and green to a near-white-light region by varying the dopant composition and exploiting the efficiency of the energy transfer between Ce^{3+} and Tb^{3+} ions in the $Ba_2MgSi_2O_7$ host.

PII-03

DEVELOPMENT AND EXPERIMENTAL INVESTIGATION OF A SAND-BASED THERMAL ENERGY STORAGE SYSTEM INTEGRATED WITH SOLAR ENERGY

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Abstract. The increasing adoption of solar energy has intensified the demand for efficient, affordable, and environmentally sustainable energy storage technologies. Sand-based thermal energy storage is a promising solution because of its low material cost, high thermal stability, and suitability for long-duration heat storage. In this study, a compact solar-powered sand battery was designed, fabricated, and experimentally evaluated using 2 kg of white quartz sand as the storage medium. The unit had an effective volume of approximately 1700 cm^3 and was heated by a 14.2 W-DC resistive heating element. Ceramic wool layers with thicknesses ranging from 1 to 4 cm were investigated to assess their influence on thermal performance. Numerical simulations and experiments were conducted to evaluate temperature distribution, charging behavior, and heat retention. The results showed that increasing the insulation thickness significantly reduced heat loss, with the maximum core temperature increasing from approximately 52 °C for a 1 cm layer to 73 °C for a 4 cm layer after two charging cycles. The substantial temperature difference between the sand core and the outer surface further confirmed the effectiveness of the ceramic wool insulation. Moreover, the measured temperature profile closely agreed with the theoretical prediction, demonstrating the reliability of the thermal model. The proposed system provides a compact and cost-effective approach to converting solar electricity into stored thermal energy, with potential for small-scale renewable-energy applications.

PII-04

LUMINESCENCE PROPERTIES, JUDD–OFELT PARAMETERS, AND ENERGY TRANSFER MECHANISMS IN Tb^{3+}/Eu^{3+} CO-DOPED Zr-BDC METAL–ORGANIC FRAMEWORKS

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Abstract. In this study, a series of lanthanide metal–organic frameworks based on 1,4-benzenedicarboxylic acid (H_2BDC), including pure Eu-BDC and Zr-BDC matrices doped/co-doped with Tb^{3+} and Eu^{3+}, were successfully synthesized via a microwave-assisted hydrothermal method at 120 °C for 10 min. By utilizing Zr-BDC as an optically transparent matrix in the visible region, concentration quenching was effectively suppressed, thereby optimizing the emission efficiency of the single-doped systems (Zr-BDC:20Tb and Zr-BDC:5Eu). Upon excitation at 254 nm, Zr-BDC:20Tb exhibited strong green emission, dominated by the $^5D_4 \rightarrow {}^7F_5$ transition at ~542 nm alongside weaker transitions at approximately 489 nm ($^7F_6$), 583 nm ($^7F_4$), and 621 nm ($^7F_3$). Remarkably, in the co-doped Zr-BDC:5Eu,20Tb system under 254 nm excitation, a highly efficient intermetallic energy transfer from Tb^{3+} to Eu^{3+} was demonstrated. This process leads to a significant decrease in the characteristic emission intensity of Tb^{3+} at 489 nm and 542 nm. Simultaneously, the emission intensity of Eu^{3+} is enhanced across a series of transitions peaking at 592 nm ($^5D_0 \rightarrow {}^7F_1$), 615 nm ($^5D_0 \rightarrow {}^7F_2$), and 699 nm ($^5D_0 \rightarrow {}^7F_4$). Furthermore, the Judd–Ofelt intensity parameters (Ω_2 and Ω_4) were determined for the Eu^{3+}-singly doped and Tb^{3+}/Eu^{3+}-codoped samples to gain deeper insights into the local site symmetry and chemical bonding environment around the Eu^{3+} ions. By modulating the energy transfer dynamics within the Zr^{4+}-based host BDC framework, the emission color was successfully tuned from pure green to the orange–red region, as confirmed by CIE chromaticity analysis. These findings highlight the potential of Tb/Eu co-doped Zr-BDC MOFs for color-tunable luminescent materials and optical sensing devices.

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PII-05

DUAL-MODE PHOTOLUMINESCENCE PROPERTIES OF MULTI-LANTHANIDE-FUNCTIONALIZED GD-BASED METAL–ORGANIC FRAMEWORKS

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Abstract. In this work, a multi-lanthanide-functionalized metal–organic framework (MOF) system was successfully synthesized by co-doping Eu^{3+}, Tb^{3+}, Er^{3+}, and Yb^{3+} ions into a Gd-based MOF matrix Gd-MOF) via a solvothermal method at 200°C for 24 hours. The crystal structure, surface morphology, functional groups, and thermal stability of the synthesized MOF were systematically characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), Fourier-transform infrared spectroscopy (FTIR), and thermogravimetric-differential scanning calorimetry (TG-DSC), respectively. The photoluminescence properties were investigated under dual-wavelength excitations. Under 473 nm excitation, the material exhibits strong downshifting emissions dominated by intense peaks at 543 nm ($^5D_4 \rightarrow {}^7F_5$ of Tb^{3+}) and 613 nm ($^5D_0 \rightarrow {}^7F_2$ of Eu^{3+}) via an efficient $Tb^{3+} \rightarrow Eu^{3+}$ energy transfer, alongside relatively weaker emissions at 489 nm (Tb^{3+}) as well as 590, 650, and 702 nm (Eu^{3+}).

Upon 976 nm NIR excitation, characteristic upconversion emissions of Er^{3+} (496, 550, 593 and 622 nm) were observed through Yb^{3+} -sensitized energy transfer upconversion. The combination of structural stability, thermal robustness, and dual-mode photoluminescence underlines the high potential of this multifunctional Gd-MOF system for advanced optical anti-counterfeiting and data encryption.

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PII-06

THỦY TINH ALUMINOSILICATE PHA TẠP Mn^{2+}: QUY TRÌNH CHẾ TẠO VÀ TÍNH CHẤT QUANG

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Tóm tắt. Hệ thủy tinh aluminosilicat Al_2O_3–SiO_2 pha tạp Mn^{2+} với nồng độ 1,0 – 5,0 wt% đã được chế tạo bằng phương pháp sol – gel. Phổ Raman cho thấy các dao động đặc trưng của mạng aluminosilicat (uốn T-O-T, kéo dãn Q^n), xác nhận Mn^{2+} được đưa vào cấu trúc mà không phá vỡ đáng kể khung mạng nền. Phổ phát quang (PL) thể hiện sự phụ thuộc mạnh vào bước sóng kích thích: dưới kích thích 330 và 345 nm, mẫu phát xạ dải rộng ~390–410 nm liên quan đến khuyết tật mạng nền; trong khi kích thích trực tiếp ở 410 nm làm xuất hiện dải phát xạ đặc trưng $^4T \rightarrow {}^6A_1$ của Mn^{2+} tại ~590–620 nm, cho thấy hiện tượng kích thích lọc lựa giữa các tâm phát quang khác nhau. Cường độ PL đạt cực đại tại nồng độ 2,0 wt% Mn, sau đó giảm mạnh ở 3,0 và 5,0 wt% do hiệu ứng dập tắt nồng độ (cross-relaxation, di trú năng lượng giữa các ion Mn^{2+}). Đáng chú ý, khi nồng độ tăng, đỉnh phát xạ đặc trưng dịch dần từ 590 sang 620 nm, phản ánh sự di trú năng lượng ưu tiên đến các vị trí Mn^{2+} có trường tinh thể mạnh hơn. Kết quả cho thấy mối liên hệ chặt chẽ giữa cấu trúc mạng và tính chất quang của Mn^{2+}, mở ra tiềm năng ứng dụng trong vật liệu phát quang trạng thái rắn.

Từ khoá: Aluminosilicate, Mn^{2+}, phổ phát quang, phổ Raman, cross-relaxation.

PII-07

IN-SITU RAMAN–ELECTROCHEMICAL CORRELATION OF DOPAMINE OXIDATION ON Ag/ZnO/ITO ELECTRODES

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Abstract. Dopamine (DA) is a key neurotransmitter whose sensitive and reliable detection is important for clinical diagnostics and neuroscience research. In this work, we present a dual-mode sensing platform based on Ag/ZnO nanostructures grown on indium tin oxide (ITO) substrates, combining surface-enhanced Raman spectroscopy (SERS) and cyclic voltammetry (CV) to monitor dopamine oxidation in situ. Electrochemical measurements were carried out in phosphate-buffered saline (PBS, pH 7) containing 10^{-4} M dopamine at a scan rate of 10 mV/s. The CV response of DA-containing solution showed a well-defined anodic peak near +0.35 V and a cathodic peak near -0.1 V, both absent in the blank electrolyte, confirming efficient electro-oxidation of dopamine at the Ag/ZnO/ITO surface. Raman spectra were acquired concurrently during the same CV cycle, revealing two broad bands centered near 1400 and 1580 cm^{-1}. These features correspond to the catechol ring C-C/phenolic vibrations (~1330 and ~1478 cm^{-1}, unresolved due to SERS broadening) and the phenyl C=C stretch (~1580 cm^{-1}) that constitute the well-known SERS signature of dopamine bound to silver through a bidentate catechol–Ag surface complex. Notably, the intensity of these bands increased progressively as the anodic potential sweep proceeded, tracking the electrochemical oxidation of DA in real time rather than reflecting a static, ex-situ snapshot. This time-resolved correlation between the electrochemical redox potential and the SERS spectral response demonstrates that catechol adsorption and oxidation at the Ag/ZnO surface directly govern the enhanced Raman signal. The results establish Ag/ZnO/ITO as a promising dual-mode platform for simultaneous electrochemical and molecular-level (SERS) detection of dopamine, offering a pathway toward more selective and information-rich neurotransmitter biosensors.

Keywords: dopamine, surface-enhanced Raman spectroscopy, cyclic voltammetry, Ag/ZnO nanostructures, in-situ detection.

PII-08

FABRICATION OF AN MXene CHITOSAN-BASED ELECTROCHEMICAL SENSOR FOR NITRITE DETECTION IN WATER

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Abstract. Nitrite accumulation in aquatic environments poses significant risks to water quality and aquaculture, creating a demand for rapid, sensitive, and readily deployable monitoring methods. This study reports the fabrication of an electrochemical nitrite sensor based on a $Ti_3C_2T_x$ MXenechitosan composite. $Ti_3C_2T_x$ MXene was successfully synthesized from a Ti_3AlC_2 precursor by molten-salt thermal treatment. X-ray diffraction, scanning electron microscopy, and Raman spectroscopy were used to examine its structural and morphological properties. The results confirmed the formation of the target MXene material, with the sample treated at 700 °C exhibiting a single-phase crystalline structure. The MXene was subsequently combined with chitosan and deposited onto a glassy carbon electrode by a simple drop-casting method to obtain the MXeneCSGCE sensing platform. Its electrochemical response toward nitrite was investigated using cyclic voltammetry, square-wave voltammetry, differential pulse voltammetry (DPV), and chronoamperometry over the concentration range of 0.5–5.0 mM. All techniques produced clear concentration-dependent responses, confirming the effective electrocatalytic oxidation of nitrite at the modified electrode. Cyclic voltammetry provided the highest current sensitivity, whereas DPV achieved the lowest limit of detection of 12.41 μM, corresponding to approximately 0.57 mg L^{-1} as NO_2^-. Its low background variation further supported the reliability and reproducibility of quantitative measurements. Chronoamperometric measurements demonstrated a rapid response, with t_{95} below 3 s, and stable analytical behavior across the investigated concentration range. The sensor also showed good selectivity toward nitrite in the presence of common interfering ions and retained more than 96% of its initial response after seven days of storage, while remaining functional after 21 days. Importantly, the detection limit is below the 35 μM warning threshold relevant to intensive shrimp-farming water. These results indicate that the MXeneCS-modified electrode provides a practical platform for rapid nitrite detection and has considerable potential for routine water-quality assessment and integration into smart aquatic environmental monitoring systems.

Keywords: MXene; chitosan; nitrite detection; electrochemical sensor; water-quality monitoring.

PII-09

EFFECT OF PRECURSORS AND HEAT TREATMENT ON THE PHOTOELECTROCHEMICAL WATER SPLITTING PERFORMANCE OF Fe_2O_3 PHOTOANODES

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Abstract. Hydrothermal synthesis is one of the most effective methods for fabricating Fe_2O_3 nanostructures on FTO substrates for photoelectrochemical (PEC) water splitting. However, this method is strongly influenced by the synthesis conditions, particularly the precursor ratio. Consequently, Fe_2O_3 nanostructures exhibit significant variation in morphology, which in turn affects the PEC performance of the resulting photoanodes. Motivated by this observation, the present study optimizes the PEC properties of Fe_2O_3-based photoanodes by controlling the precursor ratio between $FeCl_3 \cdot 6H_2O$ and urea (Fe/U). The results show that a Fe/U ratio of 1.5:1 is most suitable for synthesizing Fe_2O_3 nanorods, yielding the highest photocurrent among the samples studied. To further enhance PEC performance, the as-synthesized Fe_2O_3 nanorods were subjected to a two-step annealing treatment at 550 °C for 2 h in air, followed by 750 °C for 1 h in Ar. This treatment achieved a photocurrent density of approximately 0.63 mA/cm² at 1.23 V vs. RHE. These findings demonstrate that precursor ratio control and post-synthesis annealing are effective strategies for optimizing Fe_2O_3-based photoanodes for PEC water splitting applications.

Keywords*: PEC, water splitting, Fe_2O_3 nanorod.*

PII-10

THE PRESENCE OF ENDOGENOUS PHOTOSENSITIZERS IN CANDIDA ALBICANS CELLS AS A FACTOR MEDIATING PHOTOINACTIVATION OF THIS MICROORGANISM BY BLUE LASER LIGHT

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Abstract. The increasing number of antimicrobial-resistant pathogenic microorganisms requires the development of new methods for eradicating microbes. The radiation from lasers and LEDs in the blue spectral range (400 – 470 nm) has disinfecting properties against a number of bacterial and fungal pathogens [1–4]. Therefore, such optical therapeutic methods have potential for medical use. The aim of this study is to elucidate the physicochemical basis of photoinactivation of pathogenic microorganism without the addition of external photosensitizers. The culture studied in this work was pathogenic yeast strain *Candida albicans* (ATCC 10231).

A suspension of yeast in a saline solution with a cell concentration of $1{,}5 \times 10^5$ CFU/mL was exposed to radiation from a laser diode with a wavelength of 405 nm and a power density of 100 mW/cm^2. It was found that irradiation of the yeast for 100 minutes resulted in a 98% reduction in the number of colony-forming units compared to the non-irradiated suspension sample. Since photochemical reactions initiated by blue laser radiation are involved in photodamage to the cellular structures of *C. albicans* and may be accompanied by the emission of light, a comparative chemiluminescence assay on yeast suspensions exposed to laser irradiation at different wavelengths in the blue spectral region at the same power density was carried out. It has been established that the highest chemiluminescence light sum occurs after irradiating yeast with laser light at a wavelength of 405 nm. This suggests that radiation with a maximum spectral intensity near 405 nm is more effective for inhibiting the growth of *C. albicans* than radiation at other wavelengths in the spectral range from 395 to 445 nm.

It was found that porphyrins absorb radiation at a wavelength of 405 nm in yeast, as bands of these compounds were detected in the fluorescence spectra of cell extracts in a 1 M hydrochloric acid solution at this excitation wavelength. Comparison with the spectral characteristics of solutions of chemically pure porphyrins in hydrochloric acid suggested the presence of protoporphyrin IX and coproporphyrin III in yeast extracts. Moreover, fluorescence of flavin compounds was detected in the fluorescence spectra of aqueous yeast extracts at an excitation wavelength of $\lambda_{ex} = 405$ nm. Since porphyrin and flavin molecules can generate singlet oxygen after absorbing radiation, it is suggested that these compounds act as endogenous photosensitizers, which initiate photooxidative reactions in cells and lead to yeast death.

Thus, this study identified the primary stage of photochemical reactions underlying the antimicrobial effect of blue laser light. Furthermore, the results enable the selection of the

optimal spectral composition of radiation to suppress the growth of *C. albicans*, which may be applied to treat infections caused by this pathogen.

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PII-11

GOLD NANOARCHITECTURES FOR SERS-BASED TRACE DETECTION OF INDIVIDUAL DYES AND DYE MIXTURES

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Abstract. Surface-enhanced Raman scattering (SERS) is widely used for trace-level molecular analysis because it combines the vibrational fingerprinting capability of Raman spectroscopy with substantial signal amplification provided by plasmonic nanostructures. In this study, three gold architectures, namely nanoporous gold, branched gold nanoparticles, and gold nanobipyramids, are investigated as SERS-active substrates for the detection of selected organic dyes at low concentrations. Collectively, these architectures exhibit distinct structural features, such as interconnected porous networks, highly curved branched surfaces, sharp tips, and nanoscale gaps between neighboring particles. These features can influence local electromagnetic field confinement and consequently affect the resulting SERS response. The morphology and surface characteristics of the substrates are examined by field-emission scanning electron microscopy, while their optical behavior is characterized by UV–Vis spectroscopy to evaluate the relationship between plasmonic absorption and the Raman excitation wavelength. SERS measurements are carried out over a range of dye concentrations using the same sample preparation and spectral acquisition conditions for all substrates, allowing a consistent comparison of their sensing responses. The substrate showing the most favorable response at low analyte concentrations is subsequently selected for the analysis of mixed organic dyes. Its analytical performance is further assessed through spatial signal uniformity at ten randomly selected positions, measurement repeatability, and stability over time. Overall, this study examines how distinct surface architectures affect the SERS response of gold-based sensing platforms and provides insight into the roles of porous networks, branched features, sharp tips, and interparticle junctions in SERS signal enhancement. The results establish a practical basis for selecting Au-based SERS platforms for trace organic dye analysis and for the spectroscopic recognition of multiple dye components in mixed samples.

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PII-12

FIRST-PRINCIPLES INSIGHTS INTO RAMAN SPECTRA, RASHBA SPIN SPLITTING, AND PHONON-LIMITED CARRIER MOBILITY IN 2D JANUS MATERIALS

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Abstract. Two-dimensional (2D) Janus materials have drawn significant interest in nanoelectronics and spintronics due to their intrinsic vertical structural asymmetry [1–4]. In this work, we present a systematic first-principles study on the vibrational dynamics, Raman spectra, electronic structures, spin–orbit coupling (SOC)-induced spin splitting, and carrier transport behavior of selected 2D Janus materials. Phonon dispersion relations and theoretical Raman spectra verify dynamical stability while establishing optical signatures to guide experimental identification. Electronic calculations reveal semiconducting behavior with suitable bandgaps. Incorporating SOC gives rise to notable band splitting and a pronounced Rashba effect, emphasizing their strong promise for spintronic applications. Furthermore, intrinsic carrier transport parameters and mobilities are comprehensively evaluated by accounting for multi-phonon scattering mechanisms. These results deliver fundamental physical insights into 2D Janus systems, establishing a key theoretical foundation for designing next-generation electronic and spintronic architectures.

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PII-13

EFFECT OF Co-DOPING ON THE STRUCTURAL, OPTICAL AND PHOTOCATALYTIC DEGRADATION PROPERTIES OF $Li_{2-x}Co_xTiO_3$

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Abstract. In this paper, $Li_{2-x}Co_xTiO_3$ (x = 0 - 0.25) ceramic powders were synthesized via a hydrothermal route followed by thermal annealing at 800°C. Structural analysis indicates that low substitution levels ($x \leq 0.15$) preserve the pure monoclinic phase within the solid-solubility limit, whereas exceeding this limit at x = 0.25 induces phase separation and the formation of a secondary cubic $Li_2CoTi_3O_8$ spinel phase. Optical measurements reveal that pristine Li_2TiO_3 possesses a wide optical bandgap of 3.94 eV restricted to the ultraviolet region. Incorporating Co^{2+} introduces intra-gap defect states that enable multi-band electronic transitions spanning the ultraviolet, visible, and near-infrared spectra. Photocatalytic evaluations toward Rhodamine B (RhB) degradation show that pristine Li_2TiO_3 exhibits the highest efficiency, degrading 89% of the dye within 60 minutes. Conversely, cobalt doping suppresses photocatalytic activity, reaching a maximum efficiency of 66% among doped samples. This efficiency decline is attributed to excessive intra-gap defect centers and dopant clustering, which act as non-radiative recombination sites for photogenerated electron - hole pairs.

PII-14

MULTI-RESONANT NEAR-INFRARED ABSORPTION IN A SIZE-GRADED Au/SiO_2 METASURFACE

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Abstract. This paper presents a multi-resonant high-absorption metasurface for near-infrared (NIR) applications. The proposed structure consists of ten vertically stacked Au/SiO_2 disk pairs on a 100-nm-thick Au ground film. Each pair comprises a 30-nm-thick Au disk and a 10-nm-thick SiO_2 disk, with disk diameters gradually decreasing from 1000 to 730 nm in 30-nm increments. Numerical simulations are performed using Lumerical FDTD Solutions based on the finite-difference time-domain (FDTD) method. The results demonstrate multiple pronounced absorption resonances over 1000–2000 nm, with several peaks approaching unity in the 1.5–1.9 μm region and strongly suppressed reflection. The multi-resonant high-absorption response is attributed to plasmonic resonance coupling among the Au disks, SiO_2 layers, and Au ground film. The proposed size-graded metasurface offers a promising platform for NIR sensing, photodetection, and photothermal applications.

Keywords: Multi-resonant high-absorption metasurface, plasmonic metasurface, metal–insulator–metal (MIM), near-infrared absorption, size-graded structure.

PII-15

PARAMETERS OF LOW-TEMPERATURE LUMINESCENCE OF CURCUMIN

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Abstract. Interest in photonics and sensitizing properties of cur cumin (a natural preparation from the rhizomes of the plant *Curcuma longa*) is due to the discovery at the end of the last century of an enhancement of its antimicro bial, fungicidal, and anticancer action due to the photo dynamic effect when exposed to light in the blue spectral region, corresponding to the absorption band of this preparation.

Taking into account the above, the aim of this work was to study the luminescent properties of curcumin in glass matrices of organic solvents at 77 K and to evaluate the quantum yield of singlet oxygen generation in various organic solvents at room temperature using an analytical grade preparation.

The low- temperature luminescence (T = 77 K) of the analytical- grade polyphenolic preparation curcumin from the rhizomes of Curcuma longa was studied using 2-methyltetrahydrofuran and ethanol as solvents, com pared with its fluorescence properties at room tempera ture (T = 293 K). It was shown that at room temperature, the deactivation of the S1 level of curcumin occurs pre dominantly via non- radiative pathways, since the values of the rate constant for non- radiative deactivation of the excited singlet state k_{nr} significantly exceed the corre sponding values of the fluorescence rate constant *kfl* for each solvent. The transition to low temperature, accompanied by the formation of rigid glass solvent matrices, leads to a decrease in the efficacy of non- radiative pro cesses in curcumin, a significant increase in the quantum yield of fluorescence and the lifetime of its decay, as well as a sharp decrease in the Stokes shift. The contributions of non- radiative and radiative processes to the deactiva tion of the excited singlet state of curcumin at T = 77 K are similar ($k_{nr} \approx k_{fl}$). Furthermore, at T = 77 K, in con trast to room temperature (T = 293 K), the fluorescence and fluorescence excitation spectra of curcumin exhibit a pronounced vibrational structure. This may be due to the formation of a keto form of curcumin upon cooling, along with the enol tautomers prevalent at room temperature. The spectral characteristics of the keto form differ from those of the enol tautomer. In rigid glass matrices of 2-methyltetrahydrofuran and ethanol, phosphorescence with a maximum at $\lambda_{max\ ph}$ = 635 nm was recorded, the attribution of which to curcumin was confirmed for the first time by the correspondence of its excitation spectrum to the fluorescence excitation spectrum of curcumin at 77 K. Estimates showed that the quantum yields of curcumin phosphorescence (φ_{ph}) at T = 77 K in glass matrices of 2- methyltetrahydrofuran and ethanol are $\varphi_{ph} = 7.2 \cdot 10^{-4}$, and $\varphi_{ph} = 7.9 \cdot 10^{-4}$, and the phosphorescence decay time is τ_{ph} = 4.6 ms and τ_{ph} = 5.5 ms, respectively. By monitor ing the luminescence of singlet oxygen sensitized by cur cumin in the 1270 nm region, its quantum yield (φ_{Δ}) was determined in a number of organic solvents. The obtained φ_{Δ} values are 1.4–2.0 times higher than published data from 30 years ago, supporting the important role of this in termediate in the mechanism of photochemical processes that determine the sensitizing effect of curcumin

The work was carried out with the financial support of the Belarusian Republican Foundation for Fundamental Research (project No. F25UZB-132).

PII-16

METHODS OF ANTIMICROBIAL PHOTODYNAMIC THERAPY BASED ON THE EXCITATION OF ENDOGENOUS AND EXOGENOUS PHOTOSENSITIZERS: ADVANTAGES AND DISADVANTAGES

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Abstract. According to data from the World Health Organization, one in eight deaths worldwide is associated with bacterial infections due to the development of microbial resistance to antibiotics. For this reason, the development of new effective methods to suppress the growth of pathogenic microorganisms is a highly relevant task. One of the promising approaches aimed at overcoming antibiotic resistance is antimicrobial photodynamic therapy (APDT), which is effective against a wide range of opportunistic and pathogenic microorganisms, including vegetative bacteria, spore-forming bacteria, and fungi. To evaluate the effectiveness of methods for the antimicrobial action of optical radiation when exciting endogenous and exogenous photosensitizers. The study assessed the effectiveness of PDT methods when microorganisms are exposed to optical radiation whose spectral range (380-470 nm) corresponds to the absorption spectrum of photosensitizers localized in microbial cells (EndPDT), as well as when exogenous photosensitizers introduced from outside are excited (ExPDT). As such photosensitizers, we propose extracts of medicinal plants approved by the Ministry of Health, curcumin, furasol, and amphotericin B. The studies carried out have shown that the main advantages of APDT methods over purely drug-based therapies are as follows: a) the absence or development of mild resistance of microorganisms to photodynamic action. The reason for the reduced photosensitivity of pathogens with repeated EndAFDT is the partial bleaching of the sensitizers; b) universality: the methods are effective against both gram-positive and gram-negative strains, including multidrug-resistant bacteria; c) lack of narrow specificity: unlike antibiotics, which are typically effective against specific microorganisms, photodynamic inactivation demonstrates effectiveness against a wide range of bacteria; d) synergy with antibiotics: photodynamic exposure can restore the sensitivity of resistant strains to traditional antibiotics; e) destruction of biofilms: photodynamic exposure destroys the protective matrix of biofilms or prevents their formation.

It should also be noted that the EndAPDT and ExAPDT methods are characterized by their own features, advantages, and disadvantages. Thus, EndAPDT is implemented without the use of external dyes that require permission from the Ministry of Health. Moreover, EndAPDT shows virtually the same sensitivity to both gram-positive and gram-negative bacterial cells, which is not typical for ExAPDT. However, with the correct choice of photosensitizer, the antimicrobial effect of ExAPDT significantly exceeds the effectiveness of EndAPDT.

Thus, APT methods can be effectively used to overcome antibiotic resistance in the treatment of localized bacterial infections. The work was carried out with the financial support of the Belarusian Republican Foundation for Fundamental Research (project No. F25UZB-132).

PII-17

DESIGN AND THERMAL COMPENSATION ANALYSIS OF A 10× DISCRETE-STEP ZOOM OPTICAL SYSTEM FOR COOLED MWIR THERMAL IMAGING

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Abstract. This paper presents the design methodology and results of a mid-wave infrared (MWIR) imaging optical system operating in the 3–5 μm spectral band and employing a cooled FLIR Neutrino LC detector. The optical system adopts a discrete-step zoom configuration with three focal lengths of 25 mm, 100 mm, and 250 mm (10× zoom ratio). The imaging performance is quantitatively evaluated based on Ophir's image-quality criteria for MWIR thermal imaging systems with a 15 μm pixel pitch. In addition, the paper investigates the capability of the optical system to compensate for temperature-induced degradation in imaging performance. The resulting optical design data provide a technical basis for the fabrication and development of prototypes intended for scientific and technological research applications.

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PII-18

PATTERNS OF THE INHIBITORY EFFECT OF BLUE LIGHT ON THE GROWTH OF MICROORGANISMS OF THE GENUS *KLEBSIELLA*

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Abstract. This study demonstrates the ability of blue-spectrum radiation to inactivate the most dangerous representatives of the genus Klebsiella bacterial cells of *Klebsiella oxytoca* and *Klebsiella pneumoniae* under in vitro conditions, and investigates the mechanism of photochemical processes that determine the destructive effect of light. It has been established that exposure to light with a wavelength of 405 nm leads to a decrease in the ability of these microorganisms to form colonies. The cause of light-induced death of microorganisms is the absorption of light by endogenous photosensitizers of porphyrin and flavin nature, followed by the formation of reactive oxygen species (ROS). The presence of the specified photosensitizers in *K. oxytoca* cells has been confirmed by spectral-fluorescence methods. Among the endogenous tetrapyrroles, free bases (coproporphyrin III, uroporphyrin III) predominate, as well as their zinc complexes, which are characterized by the presence of intense absorption bands (Soret bands) in the violet region of the spectrum and high efficiency of singlet oxygen generation. Estimations have shown that the concentration of endogenous porphyrins in *K. oxytoca* microbial cells is at the level of 5 nM. The dose dependence of photoinactivation is non-monoexponential: at its initial stage, a certain latent period is observed, characterized by a very low rate of photoinactivation; as the energy dose increases further, the rate of photoinactivation increases sharply; at high doses, the rate of inactivation decreases again. This behavior of the dose curve is explained based on the model of multiple targets of photoinactivation, and the main reason for the slowdown in the rate of photoinactivation at high energy doses is the photodestruction of endogenous photosensitizers.

It has been established that light-induced disruption of cell membrane integrity does not play a decisive role in inhibiting the growth of microorganisms. This conclusion follows from the fact that at energy doses that cause a 50-60 % reduction in the number of colony-forming units, the disruption of cell membrane integrity is characterized by a low magnitude. For the first time, the importance of damage to the protein structures of microbial cells in disrupting the functional properties of membranes and in realizing the antimicrobial effect of blue light has been shown, which may be due to the formation of complexes of endogenous photosensitizers with protein macromolecules and the high value of the rate constant of the chemical interaction of ROS with proteins. The work was carried out with the financial support of the Belarusian Republican Foundation for Fundamental Research (project No. F25UZB-132).

PII-19

STUDY ON THE EFFECT OF CRYSTALLIZATION BEHAVIOR ON SOFT MAGNETIC PROPERTIES OF LASER-ANNEALED FINEMET RIBBONS

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Abstract. Amorphous Finemet ribbons fabricated via the melt-spinning technique are renowned for their exceptional soft magnetic properties and broad engineering applications. This study investigates the influence of crystallization behavior on the magnetic performance of these ribbons when subjected to localized laser heat treatment. Specifically, amorphous Finemet precursors were annealed using a 200 W fiber laser source to induce controlled nanocrystallization. Our findings indicate that laser irradiation successfully crystallizes the amorphous matrix, yielding a uniform distribution of nanocrystals with sizes in the range of several tens of nanometers. This microstructural evolution significantly enhances the macroscopic magnetic response of the material. Under optimal laser treatment parameters—specifically a scanning speed of 2100 mm/min, a laser power about of 60 W, and a beam diameter of 3 mm—an optimal crystallization degree of up to 54% is achieved. Consequently, the nanocrystalline Finemet ribbons exhibit a marked reduction in magnetic loss and a sharp decrease in coercivity (Hc) to approximately 20 A/m compared to their as-spun counterparts. Ultimately, this research demonstrates that fiber laser annealing is a highly effective technique for precisely tailoring the microstructure and optimizing the soft magnetic properties of Finemet alloys for advanced electromagnetic applications.

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PII-20

FLUORESCENT-FILM IMAGING FOR TWO-DIMENSIONAL CHARACTERIZATION OF UVC LED RADIATION

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Abstract. Accurate characterization of the spatial irradiance distribution of ultraviolet-C light-emitting diodes (UVC LEDs) is important for applications requiring controlled irradiation and uniform dose delivery. However, conventional point-by-point measurements are time-consuming and may be affected by the angular response of the photodetector, particularly at positions away from the optical axis. In this study, a fluorescent-film imaging approach is employed to visualize and reconstruct the two-dimensional (2D) irradiance distribution of a UVC LED. The fluorescent film converts incident UVC radiation into visible emission, allowing the spatial radiation pattern to be captured using a CMOS camera. Irradiance values were measured at selected positions using a photodetector connected to a power meter, while the gray-level distribution extracted from the fluorescent image provided spatial information across the measurement plane. To verify the relationship between the fluorescent image and the actual irradiance distribution, the normalized gray-level profile was compared with the irradiance distribution obtained from a previously established optical model, showing excellent agreement. The fluorescent image was then used to correct the point measurements and reconstruct the 2D irradiance map. The results demonstrate that fluorescent-film imaging can effectively represent the irradiance distribution of UVC LEDs. This approach provides a simple and cost-effective method for 2D irradiance mapping while reducing the number of point measurements required.

PII-21

Ce-DOPED ZnO/Ag NANOSTRUCTURES AS SERS SUBSTRATES FOR MICROPLASTIC DETECTION

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Abstract. Microplastic pollution has become a growing environmental concern, highlighting the need for rapid and sensitive detection methods. In this study, a surface-enhanced Raman scattering (SERS) substrate based on Ce-doped ZnO decorated with Ag nanoparticles (Ce:ZnO/Ag) was developed for the detection of polystyrene (PS) microplastics. Ce-doped ZnO was synthesized via a wet chemical method with varying Ce concentrations to evaluate the influence of Ce doping on the SERS performance. Ag nanoparticles were subsequently deposited onto the Ce-doped ZnO surface to enhance the Raman response through localized surface plasmon resonance (LSPR). The results demonstrate that the Ce:ZnO/Ag substrate provides an enhanced Raman response for PS microplastics compared with the undoped ZnO-based substrate. These findings suggest that Ce:ZnO/Ag is a promising SERS platform for sensitive detection of PS microplastics, with potential applications in environmental monitoring.

PII-22

ADAPTIVE ILLUMINATION-CONTROLLED RESOLUTION ENHANCEMENT FOR OPTICAL MICROSCOPY

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Abstract. This study proposes a method for enhancing the image resolution of an optical microscopy system based on adaptive illumination intensity control combined with computational image processing. Unlike conventional image acquisition methods that employ a fixed illumination condition, the proposed method actively varies the illumination intensity to control the imaging response of the system, from the linear response regime to the regime affected by saturation. A set of images is acquired under different illumination intensity levels and modeled using the point spread function and optical transfer function of the microscopy system. The images acquired under different illumination conditions are jointly exploited during the reconstruction process to recover spatial information degraded by the optical limitations, noise, and image acquisition process. A physics-based image restoration method is developed to integrate information from multiple observations, thereby improving the effective spatial resolution and overall image quality. The performance of the proposed method is evaluated using modulation transfer function, full width at half maximum, peak signal-to-noise Ratio, and structural similarity index. The proposed approach aims to exploit variations in the system response under different illumination conditions to improve the recovery of fine image details without requiring significant modifications to the optical configuration of the microscope. The method has potential applications in biological imaging and digital pathology, particularly for low-contrast specimens containing fine and closely spaced structures.

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PII-23

STRUCTURAL AND OPTICAL PROPERTIES OF CdS:Tb^{3+} AND CdS:Tb^{3+}/ZnS CORE/SHELL QUANTUM DOTS

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Abstract. Tb^{3+}-doped CdS quantum dots (CdS:Tb^{3+} QDs) and CdS:Tb^{3+}/ZnS core/shell QDs were successfully synthesized using a wet chemical method. The influence of Tb^{3+} doping and ZnS shell coating on the structural and optical properties of CdS QDs was investigated. X-ray diffraction (XRD) analysis confirmed the formation of zinc-blende (ZB) structure and revealed that Tb^{3+} incorporation and ZnS shell growth modified the lattice parameters and crystallite size. EDX analysis has confirmed the presence of the elements in the sample. Optical studies showed that Tb^{3+} doping produced characteristic rare-earth emissions. The ZnS shell coating significantly improved the luminescence intensity and photoluminescence lifetime by reducing surface defects and suppressing non-radiative recombination. The chromaticity analysis indicated that the emission color could be tuned from cool white to warm white through Tb^{3+} doping and a ZnS shell. These results suggest that CdS:Tb^{3+} and CdS:Tb^{3+}/ZnS core/shell QDs are promising candidates for luminescent and white-light-emitting applications.

Keywords: Tb^{3+}, quantum dots, optical properties, core/shell.

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PII-24

SYNTHESIS, STRUCTURAL, AND OPTICAL PROPERTIES OF TYPE-II ZnO/ZnS CORE–SHELL SEMICONDUCTOR QUANTUM DOTS

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Abstract. Type-II ZnO/ZnS core/shell semiconductor quantum dots (QDs) with different ZnS shell thicknesses were successfully synthesized by a wet-chemical method. Three samples, including bare ZnO QDs and ZnO/ZnS core/shell QDs with thinner (ZnO/ZnS1) and thicker (ZnO/ZnS2) ZnS shells, were systematically investigated. X-ray diffraction (XRD) analysis confirmed the wurtzite structure of ZnO QDs, while the core/shell samples exhibited characteristic diffraction features associated with both wurtzite ZnO and ZnS phases. Optical absorption measurements revealed a gradual decrease in the effective band gap with increasing ZnS shell thickness, reflecting the modification of the electronic structure upon shell growth. Photoluminescence (PL) spectra of the ZnO/ZnS QDs showed a characteristic emission attributed to type-II interfacial transitions, providing evidence for spatially separated charge carriers across the ZnO/ZnS interface. Energy-dispersive X-ray spectroscopy (EDX) confirmed the presence of Zn, O, and S elements in the core/shell samples. Raman scattering (RS) spectra further revealed characteristic vibrational modes of both ZnO and ZnS, supporting the formation of the heterostructured QDs. The combined structural, compositional, vibrational, and optical results demonstrate the successful formation of ZnO/ZnS core/shell QDs and the progressive evolution of their properties with ZnS shell thickness. These findings highlight the potential of type-II ZnO/ZnS core/shell QDs for optoelectronic, light-emitting, photodetection, and photocatalytic applications where efficient charge separation and tunable optical properties are desirable.

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PII-25

INVOLVEMENT OF REACTIVE OXYGEN SPECIES IN PHOTOINDUCED DAMAGE TO CURCUMIN-SENSITIZED TUMOUR CELLS

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Abstract. Curcumin is a polyphenol isolated from the rhizome of Curcuma longa. Along with antioxidant, anti-inflammatory, antibacterial and neuroprotective activity, it is regarded as a promising photosensitizer for photodynamic therapy (PDT) of tumours, bacterial infections and skin disorders. The photochemical reactions underlying curcumin-mediated PDT, however, have not yet been characterized in detail. Aim. To determine which reactive oxygen species (ROS) mediate photodynamic injury of tumour cells sensitized with curcumin. Materials and methods. Analytical-grade curcumin (Sigma-Aldrich, USA) and the human cervical epithelioid carcinoma cell line HeLa were used. Cell monolayers were irradiated with LED or laser sources (λmax = 445 nm) at radiant exposures of 1-15 J/cm². Sodium azide (10 mM) or sodium pyruvate (10 mM) was added 30 min before irradiation. ROS involvement was monitored immediately after irradiation by chemiluminescence and at 21 h by the MTT assay. Cell death stages were analyzed by flow cytometry. Results. Flow cytometry demonstrated that a 12-hour incubation of cells with 5 μM curcumin under dark conditions exerted an inhibitory effect, accompanied by the appearance of cells in the necrotic and late apoptotic stages. Exposure to radiation within the absorption band of curcumin markedly enhanced this effect: the proportion of cells in these stages increased substantially against a background of a significant reduction in the viable cell population. The inhibition of curcumin-sensitized cells upon light exposure is mediated by ROS generation. To assess the contribution of individual ROS to the photochemical processes, the chemiluminescence method was employed. These data show the key role of singlet oxygen in the photodamage of curcumin-sensitized cells. This conclusion is based on the pronounced decrease in the integrated photoinduced chemiluminescence signal upon prior addition of sodium azide, a singlet oxygen quencher, to the cell suspension. The addition of sodium pyruvate had no significant effect, suggesting that H_2O_2 plays only a minor role in the primary photochemical stage. By contrast, assessment of cell metabolic activity 21 h after irradiation revealed a substantial contribution of hydrogen peroxide to photoinactivation, as evidenced by the protective effect of sodium pyruvate added to the cell monolayer prior to irradiation. Conclusion. ROS are the principal mediators of photodamage in curcumin sensitized cancer cells, but the species involved change with time: singlet oxygen predominates during and immediately after illumination, whereas hydrogen peroxide determines the outcome at 21 h. We therefore suggest that irradiation triggers a delayed burst of secondary ROS production, mainly H_2O_2, which drives cell death long after the light is switched off.

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INVESTIGATE THE EFFECTIVE REFRACTIVE INDEX OF TOLUENE-FILLED As_2S_3 SUSPENDED-CORE PHOTONIC CRYSTAL FIBER

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Abstract. This paper presents a numerical investigation of the effective refractive index characteristics in suspended-core photonic crystal fibers (SCFs) based on As_2S_3 chalcogenide glass, with the air holes infiltrated by toluene (C_7H_8). We systematically analyze the influence of ratio w/r_c on the effective refractive index over the wavelength range of 1.0-3.0 μm. The use of As_2S_3 provides high nonlinearity, while C_7H_8 enhances optical control, optimizing transmission performance. The results indicate that the effective refractive index varies from 2.1764 to 2.1868, depending on the fiber's structural ratio. These finding demonstrate that toluene-filled As_2S_3 SCF offer effective refractive index control, making them promising candidates for nonlinear optics and infrared light transmission applications.

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PII-27

CONTROLLING SYNCHRONOUS AND ANTI-SYNCHRONOUS OPTICAL SWITCHING UNDER RELATIVE PHASE AND EXTERNAL MAGNETIC FIELD

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Abstract. The ability to control one light beam using another has attracted considerable attention in quantum and nonlinear optics because of its potential applications in quantum information processing and optical computing [1–3]. The development of electromagnetically induced transparency (EIT) has provided an effective approach for realizing all-optical switching at low light intensities. In an EIT medium, linear absorption can be strongly suppressed while optical nonlinearities are substantially enhanced near the atomic resonance [4]. This enhanced light–matter interaction enables efficient nonlinear optical processes even at the single-photon level. Moreover, EIT can strongly influence the propagation dynamics of optical pulses, facilitating phenomena such as optical soliton formation, optical bistability, and all-optical switching.

In this work, we propose a lambda-type degenerate atomic system for investigating all-optical switching in the presence of spontaneously generated coherence (SGC) [6]. By simultaneously solving the coupled Maxwell–Bloch equations for the atomic system and the optical field in the space–time domain, we demonstrate that the continuous-wave probe field can be synchronously or nonsynchronously switched by controlling the relevant system parameters across different phase ranges. These results provide a potential approach for controlling nonlinear optical signals and may be useful for applications in optical and quantum information processing and communication.

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PII-28

CONTROLLING OPTICAL BISTABILITY AND MULTISTABILITY UNDER HIGH-ORDER DISPERSION AND EXTERNAL MAGNETIC FIELD

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Abstract. Optical bistability (OB) and optical multistability (OM) have attracted considerable attention because of their potential applications in optical switching, logic operations, optical memory, and quantum communication [1-3]. The emergence of electromagnetically induced transparency (EIT) has provided an effective platform for controlling the absorption, dispersion, and nonlinear response of atomic media at low light intensities [4, 5]. Through quantum coherence and interference, strong nonlinear interactions can be generated near atomic resonances, enabling the realization and manipulation of bistable and multistable responses [6-8].

In this work, we investigate the OB and OM properties of a degenerate three-level ^{87}Rb atomic system under influency of high-order dispersion and external magnetic field. We demonstrate that the bistable response can be effectively controlled by varying the optical properties and applied-field parameters. In particular, the system can be switched between OB and OM regimes through appropriate control of these parameters. The proposed scheme provides a simple platform for manipulating single- and multi-channel optical responses and may be useful for the development of all-optical switching and optical memory applications.

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PII-29

INVESTIGATE THE SOLITON STORAGE AND RETRIEVAL IN AN ELECTROMAGNETICALLY INDUCED TRANSPARENCY MEDIUM

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Abstract. In recent years, enormous efforts have been made to investigate optical pulse memory, which is important for the realization of optical information processing and quantum computing. One of the main techniques for realizing optical pulse memory is electromagnetically induced transparency (EIT) [1]. The light behavior in EIT systems exhibits many striking features, including substantial suppression of optical absorption, group-velocity slowdown, Kerr nonlinearity enhancement, efficient memory of optical pulses, and so on [2, 3]. Based on these features, many applications of nonlinear optical processes at a weak light level [4, 5], optical bistability, and all-optical switching [6, 7] have been developed.

One of the most prominent applications of EIT is light storage, which has critical applications in quantum informatics [8]. However, in a convenient environment, the probe pulses suffer from dispersion-induced spreading and attenuation, which may result in a serious distortion of the retrieved pulses [9]. Therefore, for practical applications of light memory, it is necessary to realize robust storage and retrieval of light pulses [10].

In this work, we study the propagation of an intense probe pulse in a three-level atomic system with EIT. We demonstrate that an optical soliton can be formed, stored, and retrieved in the system by switching the applied fields on and off. The results obtained may have promising applications in quantum information processing and optical quantum memory.

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PII-30

SPECTRAL–SPATIAL CHARACTERIZATION OF CAMOUFLAGED TARGETS IN VISIBLE, RED-EDGE, NEAR-INFRARED AND LONG-WAVE INFRARED BANDS

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Abstract. A low-complexity spectral–spatial index is proposed for assessing how well camouflaged targets match their local backgrounds from visible to thermal infrared wavelengths. The public MUCAD dataset contains 23 registered 512 × 512 multispectral captures and eight military-relevant target types. Separating annotated classes within each scene yielded 41 paired target–background observations across Blue (475 nm), Green (560 nm), Red (668 nm), red-edge (717 nm), NIR (842 nm) and LWIR (10.5 μm). For each band, symmetric mean and contrast similarities were combined with Bhattacharyya overlaps of intensity and Sobel-gradient distributions. Their geometric mean defined a bounded band score, and nested geometric fusion produced visible, reflective and complete multispectral camouflage-fidelity scores without training. LWIR had the lowest mean similarity (0.665) and the highest single-band anomaly AUC (0.825), whereas Green had the highest similarity (0.872). Independent local RX validation increased from an AUC of 0.848 (95% CI 0.813–0.880) for visible bands to 0.948 (0.931–0.964) for the six-band stack; the mean gain was 0.100 (Holm-adjusted $p <$ 0.001). The proposed exposure score correlated strongly with anomaly AUC (Spearman $\rho =$ 0.740). The complete metric loop required 18.8 s on a CPU and no model training. MS-CFI therefore offers a transparent tool for multispectral camouflage-material assessment and sensor-band selection on modest hardware.

Keywords: multispectral imaging; camouflage; red-edge; NIR; LWIR; spectral–spatial similarity.

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PII-31

PHYSICS-GUIDED FOG-STABLE BAND SELECTION FOR CPU-EFFICIENT HYPERSPECTRAL ANOMALY DETECTION

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Abstract. Fog changes hyperspectral target–background contrast through wavelength-dependent attenuation and airlight, while hundreds of correlated bands make anomaly detection expensive on low-power hardware. We propose a label-free physics-guided fog-stable band selection (FSBS) method for CPU-efficient Reed–Xiaoli (RX) detection. The selector combines robust tail saliency, entropy, clear-to-fog correlation, and contrast retention predicted by a power-law extinction model. To avoid selecting a narrow cluster of weakly attenuated long-wave bands, the ordered spectrum is divided into contiguous strata and one correlation-penalized band is selected from each stratum. The method is evaluated on all 13 public Airport–Beach–Urban hyperspectral scenes at optical depths τ_{550}=0, 0.4, 0.8, and 1.2. Ground-truth masks are used only for evaluation. With ten bands, FSBS achieves mean ROC-AUC values of 0.941, 0.939, 0.928, and 0.918, respectively. Under strong fog, full-spectrum RX obtains 0.948 and uniform ten-band RX obtains 0.921; the FSBS–uniform difference is not significant by a paired Wilcoxon test (p=0.376). FSBS removes 94.8% of the channels and reduces median online RX time from 416.9 ms to 4.07 ms per cube, a 102.4-fold speed-up. Offline selection requires 2.06 s per scene and is amortized when the same filter set is reused. The results demonstrate a transparent accuracy–runtime compromise for portable spectroscopy, while also showing that calibrated wavelengths and real fog measurements are needed before sensor-level deployment.

Keywords: hyperspectral imaging; atmospheric optics; fog; anomaly detection; band selection; CPU-efficient processing.

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PII-32

COMPARATIVE EVALUATION OF THERMAL CAMOUFLAGE CLOTHING USING SR-5000N SPECTRAL RADIOMETRY AND FIELD THERMAL IMAGING

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Abstract. The development of modern infrared observation systems has created a need to evaluate thermal camouflage effectiveness at the complete-garment level. This study evaluates five clothing sets, including K20 as a conventional camouflage uniform, NC as domestically developed thermal-imaging camouflage clothing, and three imported multispectral camouflage samples, using two complementary methods: spectral radiance measurement with the SR-5000N and field thermal-image analysis. In the laboratory, the samples were investigated in the MWIR 3–5 μm and LWIR 8–14 μm bands using a blackbody source at 45°C and 60°C. NC achieved the highest apparent radiation attenuation among the five samples, corresponding to 93.05% in MWIR and 87.94% in LWIR. In JIM LR thermal images at a distance of 150 m, NC achieved the lowest Contrast-to-Noise Ratio (CNR) of 0.4860 and the highest Histogram Intersection (HI) of 0.6415; IM-01 ranked second with a CNR of 0.5176 and an HI of 0.6375. Both evaluation approaches ranked NC and IM-01 in the top two positions, indicating consistency in the trend for the high-performing samples between spectral measurements under controlled conditions and target-background matching in field thermal images.

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Cu-DOPED CALCIUM COBALT OXIDE $Ca_3Co_{2-x}Cu_xO_6$ NANOSTRUCTURES AS NOBLE-METAL-FREE CATALYSTS FOR EFFICIENT 4-NITROPHENOL REDUCTION

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Abstract. UV-Vis absorption spectroscopy provides a simple and effective optical approach for monitoring chemical conversion processes through changes in their characteristic absorption bands. In this work, such optical monitoring was combined with catalytic materials engineering to evaluate the reduction kinetics of 4-nitrophenol using Cu-doped calcium cobalt oxide nanostructures. A series of noble-metal-free $Ca_3Co_{2-x}Cu_xO_6$ (x = 0 – 0.3) catalysts were synthesized via a sol–gel method. Calcination at 900 °C for 10 h yielded a pure rhombohedral phase (*R-3c*) with an average crystallite size of 62.34 nm. Optimal Cu^{2+} substitution (x = 0.2) transformed the morphology into a porous interconnected chain-like network, maximizing active site exposure. Evaluated through the reduction of 4-nitrophenol (4-NP) to 4-aminophenol using $NaBH_4$, $Ca_3Co_{1.8}Cu_{0.2}O_6$ exhibited superior performance, achieving complete conversion within 14 min with an apparent rate constant k_{app} of 0.233 min^{-1}, significantly outperforming pristine $Ca_3Co_2O_6$ (44 min, k_{app} = 0.174 min^{-1}). The reaction progress was optically monitored by UV–Vis absorption spectroscopy through the time-dependent decrease in the characteristic absorption band of 4-nitrophenolate at approximately 400 nm, enabling quantitative evaluation of the catalytic kinetics. The reaction followed pseudo-first-order kinetics under the Langmuir–Hinshelwood model. Furthermore, the catalyst demonstrated excellent stability over a wide pH range (9–12) and retained an 87% conversion efficiency after five consecutive cycles. These results highlight Cu-doped calcium cobaltites as promising catalysts for wastewater remediation.

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DESIGN AND NONLINEAR PROPERTIES OF $Ge_{20}Se_{70}Te_{10}$-BASED OCTAGONAL PHOTONIC CRYSTAL FIBERS

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Abstract. We investigate an octagonal-lattice photonic crystal fiber made of $Ge_{20}Se_{70}Te_{10}$ glass using the full-vectorial finite-difference method in Lumerical Mode Solutions. By changing the pitch Λ and the air-hole ratio d/Λ, we examine how the effective mode area (A_{eff}) and nonlinear coefficient (γ) evolve across the 1–12 μm range. Over this spectral window, A_{eff} spans from only a few μm^2 to more than 300 μm^2, while γ varies from tens to several thousand $W^{-1}km^{-1}$. At the 4.5 μm pump wavelength, the smallest A_{eff} of 8.077 μm^2 (Λ = 3.0 μm, d/Λ = 0.7) produces the highest nonlinear coefficient of 1383.06 $W^{-1}km^{-1}$, showing that the proposed fiber is well suited for broadband mid-infrared supercontinuum generation.

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PII-35

FABRICATION AND STUDY OF OPTICAL PROPERTIES OF $CoAl_2O_4$ NANOCRYSTALS CO-DOPED WITH Tb^{3+} AND Eu^{3+} IONS

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Abstract. $CoAl_2O_4$ nanocrystals co-doped with Tb^{3+} and Eu^{3+} ions were successfully synthesized by the Sol-Gel method. The structural characterization, optical properties, energy transfer and fluorescence lifetime of the materials were systematically investigated. Upon excitation at 379 nm, the fluorophores exhibited prominent emission peaks centered at approximately 545 nm (Tb^{3+}), 595 nm and 616 nm (Eu^{3+}), confirming the coexistence of both ions. The analysis showed that the energy transfer from Tb^{3+} to Eu^{3+} mainly occurred through electric dipole-dipole interactions. By varying the Eu^{3+}/Tb^{3+} molar ratio, the chromaticity coordinates (CIE) of the fluorophores can be tuned from blue-green to white, the yellow and orange-red regions. Time-resolved fluorescence spectra demonstrate that the average lifetime of the Eu^{3+} emission increases with Tb^{3+} doping, reaching a maximum of 4.58 ms at a Tb^{3+} concentration of 5%, beyond which a quenching effect is observed. These results highlight the potential of $CoAl_2O_4$:Tb^{3+},Eu^{3+} fluorophores for use in color-tunable optoelectronic and photonic devices.

Keywords: $CoAl_2O_4$ nanocrystal, Tb^{3+} and Eu^{3+} ions, optical property

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PII-36

EFFECT OF GRAPHENE QUANTUM DOT SIZE ON THE PHOTOVOLTAIC PERFORMANCE OF SINW/PEDOT:PSS HYBRID SOLAR CELLS

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Abstract. Graphene quantum dots (GQDs) have emerged as promising nanomaterials for improving the photovoltaic performance of hybrid solar cells due to their size-dependent optical and electronic properties. In this study, graphene oxide (GO) with different lateral dimensions was prepared from commercial graphite through a sequential exfoliation and size-reduction process. The morphology and size distribution were characterized by atomic force microscopy, revealing a gradual decrease in the average size from approximately 2 μm for exfoliated GO to 500 nm and finally to approximately 12 nm after successive processing steps. The size-dependent effect of GO/GQDs on the photovoltaic properties of Si nanowire (SiNW)/PEDOT/GQD hybrid solar cells was systematically investigated using external quantum efficiency (EQE) and current density-voltage (J-V) measurements. The results demonstrated that the spectral response strongly depended on the size of the carbon-based nanomaterials. Large GO sheets mainly enhanced the EQE in the 400-900 nm wavelength range, which was attributed to the improved electrical conductivity of the PEDOT layer. In contrast, the incorporation of 12 nm GQDs significantly enhanced the EQE in the 300-500 nm region, suggesting an enhanced photon downconversion effect. Consequently, the solar cells incorporating 12 nm GQDs exhibited the best photovoltaic performance, with a short-circuit current density (J_{sc}) of 30.61 mA cm^{-2}, an open-circuit voltage (V_{oc}) of 0.538 V, a fill factor (FF) of 58.8%, and a power conversion efficiency (PCE) of 10.76%. The enhanced photovoltaic performance is mainly attributed to improved spectral conversion, more efficient carrier transport, reduced carrier recombination, and the size-dependent electronic properties of GQDs. These results demonstrate that controlling the size of GQDs is an effective approach for enhancing the photovoltaic performance of SiNW/PEDOT/GQD hybrid solar cells.

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DESIGN AND OPTIMIZATION OF A CASSEGRAIN-TYPE INFRARED OPTICAL SYSTEM WITH A MANGIN SECONDARY MIRROR

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Abstract. This paper develops and evaluates a stepwise design procedure for a compact Cassegrain-type infrared catadioptric system incorporating a Mangin secondary mirror. The Mangin element adds refractive and reflective design variables that can improve aberration correction while preserving the folded Cassegrain geometry [1, 2]. The optical configuration consists of a long-focal-length protective meniscus, a reflective primary mirror, a correcting lens in the converging beam, and a Mangin secondary mirror. First, the Cassegrain mirror pair is determined from first-order constraints. The protective meniscus and converging-beam corrector are then introduced to compensate the residual third-order aberrations. Finally, the thin-element solution is converted into a practical thick-element model and optimized by varying surface curvatures, axial separations, and material parameters. For an effective focal length of 32.2 mm, an f'/D ratio of 0.67, a 1.5° full field of view, and a 1–3 μm spectral range, the initial configuration achieves only about 6 lp/mm at MTF = 0.2 and has a characteristic spot size of approximately 0.5 mm. After optimization, the spatial frequency at MTF = 0.2 increases to about 50 lp/mm, while the characteristic spot size decreases to approximately 0.04 mm and field uniformity improves. The results confirm that placing the Mangin element at the secondary mirror provides useful degrees of freedom for aberration balancing with a smaller optical component than a Mangin primary. This arrangement is therefore promising for compact infrared imaging systems. Recent material-optimization frameworks for catadioptric systems also provide a basis for future achromatic and athermal evaluation [3].

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DESIGN AND OPTIMIZATION OF A COMPACT INFRARED CATADIOPTRIC SYSTEM WITH A MANGIN PRIMARY MIRROR

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Abstract. This paper presents a design and numerical optimization procedure for a compact infrared catadioptric imaging system employing a Mangin primary mirror. Recent studies have demonstrated a compact all-spherical telescope with a Mangin primary mirror through fabrication and environmental testing [1], extended Mangin-based layouts to systems with a large relative aperture and wide field [2], and implemented compact long-focal-length catadioptric designs with distributed correction groups [3]. The investigated configuration comprises a long-focal-length protective meniscus, a Mangin primary mirror, a secondary folding mirror, and a two-element correcting group in the converging beam. The starting layout is synthesized from paraxial ray tracing and third-order aberration theory, converted to a thick-element model, and then refined by material selection and numerical optimization of surface curvatures and axial separations. For an effective focal length of 100 mm, a relative aperture D/f′ = 0.4 (F/2.5), a 2° full field of view, a central obscuration ratio of 0.3, and a 3–5 μm spectral range, the starting configuration exceeds 30 lp/mm at MTF = 0.2 but exhibits significant field-dependent degradation. Following optimization, all evaluated fields exceed 110 lp/mm at MTF = 0.2, while the maximum peak-to-valley wavefront error is approximately 0.20λ and the energy concentration becomes more uniform. The optimized layout also preserves practical axial clearance for compact opto-mechanical integration. These results demonstrate that a Mangin primary mirror can simultaneously support beam folding and effective aberration correction in a fast infrared imaging system. Tolerance, thermal, coating, and manufacturability analyses remain necessary for experimental realization.

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PII-39

COMPARATIVE ASSESSMENT OF VIETNAMESE AND INTERNATIONAL MILITARY CAMOUFLAGE PATTERNS BASED ON THE CIELAB COLOR SIMILARITY INDEX

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Abstract. Military camouflage contributes to enhancing the survivability of soldiers on the battlefield. This study evaluates the effectiveness of several camouflage clothing patterns currently used in Vietnam and around the world using the Color Similarity Index (CSI) based on the CIELAB color space. The CSI ranges from 0 to 1, with lower values indicating a higher degree of color similarity to the surrounding environment. The camouflage patterns were evaluated against eight environmental background regions with different color characteristics represented by L*, a*, and b* values. The results provide a quantitative basis for comparing camouflage effectiveness and assessing the suitability of each pattern for different environments, while also supporting the design and optimization of camouflage patterns appropriate for real-world environmental conditions..

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PII-40

PICOSECOND PULSE COMPRESSION AT BACKWARD STIMULATED RAMAN SCATTERING IN WATER

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Abstract. Studies of water as a nonlinear optical medium for backward stimulated Raman scattering (BSRS) and Stokes pulse compression [1] has been actively developing nowadays. Along with the possibility of obtaining radiation at new wavelengths, this interest is due to the fact that water is the cheapest and most environmentally friendly SRS-active medium. Recently in [2], we experimentally investigated for the first time the process of compression of 40 ps pulses of the Nd:YAG laser second harmonic in light water using a vertical scheme of BSRS excitation. Under conditions of pump radiation "hard" focusing (power density of ≈ 5 TW/cm^2), pulses of the first Stokes component (λ ≈ 650 nm) with a duration of 1.4 ps and a peak power of 4 MW were obtained. Compression of Stokes pulses achieved under such conditions is almost 3 times more than the previously obtained 10-fold pulse width reducing at forward SRS in a horizontal excitation scheme [3]. In this work we present the results of studies on the Stokes pulse compression at BSRS in light water excited by pulses of Nd:YAG laser second harmonic radiation in a vertical pumping scheme depending on the exciting pulse energy, conditions of pump beam focusing, and the immersion depth of the pump beam waist in the volume of water relative to the free surface of water. Pumping conditions for Stokes pulse compression at backward stimulated Raman scattering in light water excited by Nd:YAG laser second harmonic radiation have been optimized. A more than 35-fold reduction in the first Stokes pulse width (λ ≈ 650 nm) has been achieved in the absence of optical breakdown and with reduced thermal load at a pump pulse power density of about 0.6 TW/cm^2. The first Stokes pulse duration was 1.35 ps at a peak power of about 0.5 MW.

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PII-41

PICOSECOND SRS IN AQUEOUS SOLUTION OF SODIUM NITRATE IN THE VISIBLE AND ULTRAVIOLET SPECTRAL RANGES

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Abstract. For generating new laser wavelengths, stimulated Raman scattering (SRS) is often widely applied. During the last several tens of years, many studies have been done in this field, and very impressive results have been achieved using different Raman active media (solids, gases, liquids) [1]. In the last time, searching the new media for SRS, the researchers have paid attention to aqueous solutions of inorganic salts [2]. It is shown that these solutions are rather simple in use, cheap, and efficient for multifrequency SRS excited by nanosecond laser radiation at 532 nm. In this report, we submit the new results of studying SRS in the saturated aqueous solution of sodium nitrate (NaNO3) in distilled deionized light water using picosecond laser pulses in the visible and ultraviolet (UV) spectral ranges. Note, that using the ultrashort pulses leads to the elimination of stimulated Brillouin scattering, which competes with the SRS. This can help to increase the efficiency of SRS. In the experiments, the picosecond pulses at 532 (50 ps) and 355 nm (40 ps) with a pulse repetition rate of 15 Hz were applied for the excitation of SRS. The exciting laser beams were focused into the quartz cells with the NaNO3 solution. Optimum SRS generation parameters were the following. The 532 nm radiation was focused in the cell of 30 cm length by a lens with the focal length of 50 cm. For the pumping at 355 nm, the cell of 10 cm length and a lens with the focal length of 25 cm were used. After the cells, we used the correcting lens and two Pellin-Brock prisms for decomposing the SRS beams into a spectrum across space. In these conditions, we have observed the generation of four Stokes components at 564, 599, 639, 685 nm, and two anti Stokes components at 504, 479 nm using the 532 nm excitation. These components of SRS are due to the main vibration ν1 (1050 cm-1) of ionic group [NO3]- of NaNO3. The spectral and energetic characteristics of SRS have been measured. The maximum energetic efficiency of SRS for the first and second Stokes components was more than 30 % at pumping pulse energies not more than 2 mJ. For excitation at 355 nm, we have observed the SRS generation of two Stokes components at 369 and 384 nm. The efficiency was rather small (not more than 5 %). It may be due to linear and two-photon absorption of UV radiation in solution. In conclusion, for the first time to our knowledge, we have demonstrated that aqueous solution of sodium nitrate is very efficient Raman active medium for SRS conversion of ultrashort laser pulses in the visible range, and it can be also used in the UV range.

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PII-42

DESIGNING A HANDS-ON, MISSION-BASED RESIDENCY FOR QUANTUM INNOVATORS IN VIETNAM: CURRICULUM ARCHITECTURE AND EVALUATION PLAN

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Abstract. Quantum technologies are moving from laboratories toward infrastructure and industry, yet workforce studies report that employers need people who combine technical literacy with the ability to identify applications and work across disciplines [1, 2]. In Vietnam, where the quantum ecosystem is still forming, such bridging talent is scarce. We present the design of the Quantum Innovator Residency Program, a nine-month, full-time, in-person program based in Quang Trung University. The program integrates four cores: dual mentorship (one technical and one innovation mentor per innovator, meeting every two weeks), an Innovation Studio that develops innovator' entrepreneurial mindset, monthly Technical Immersion weeks, and a Social Impact Project. The immersion sequence is anchored in optics and photonics: optical-communication laboratory work, lasers and nonlinear optics on the optical bench, cleanroom nanofabrication for quantum and photonic devices, supply chains from semiconductors to photon sources and detectors, and photonic quantum programming with the Perceval framework [3], with execution on Quandela's photonic quantum processor where feasible. Innovators progress through different stages, from Boarding to Liftoff, with monthly evidence checkpoints and a Commitment gate after six months; they then enter a Venture Lane or an Industry Lane for at least two months of full-time execution. Instead of examinations, progress is assessed through an evidence portfolio: problem statements,-decision logs, project progress and a final public demonstration. We describe the curriculum architecture, the gate criteria and a planned evaluation of the first cohort in 2026 and 2027 covering capability growth and pathway outcomes.

Keywords: quantum workforce; photonics education; innovation residency; mentorship; Vietnam

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PII-43

PHASE-SENSITIVE MICROWAVE EIT IN A CLOSED-LOOP Y-TYPE FOUR-LEVEL ATOMIC MEDIUM

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Abstract. Electromagnetically Induced Transparency (EIT) is a crucial mechanism for controlling the interaction between electromagnetic fields and atomic media via quantum interference effects [1,2]. In a multi-level atomic system, additional control fields and closed-loop configurations can enhance coherent interactions among the atomic states, leading to substantial modifications of the optical response [3-5]. In this study, we theoretically investigate the linear optical response of a closed-loop four-level Y-type atomic medium, using the microwave field and the relative phase between the fields as control parameters. The steady-state solution for the coherent element ρ_{21} is formulated, enabling us to perform a simultaneous analysis of the absorption and dispersion spectral properties of the probe field. This study systematically analyzes the effects of microwave field intensity, closed-loop phase, and probe-frequency detuning on the atomic spectral transitions. The results demonstrate that coherent interactions among the fields can modify the depth and width of the EIT windows while inducing significant changes in the dispersion characteristics near resonance [6-8]. These findings provide a basis for controlling the optical response of multi-level atomic media and suggest that variations in absorption and dispersion characteristics can be exploited as optical signals sensitive to environmental changes [9,10].

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PII-44

STRUCTURAL EVOLUTION OF GRAPHENE-LIKE CARBON/Cu–Ni HYBRID MATERIALS SYNTHESIZED BY SOLUTION COMBUSTION METHOD

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Abstract. Graphene-based Cu–Ni composites are promising functional materials for catalytic, optoelectronic, and sensing applications owing to the combination of the unique electronic and surface properties of graphene with the catalytic and physicochemical properties of Cu–Ni metallic/oxide phases. In this work, graphene-like carbon structures supported on Cu–Ni metallic/oxide particles were synthesized by a simple and cost-effective solution combustion synthesis (SCS) route using metal nitrates and organic fuels as precursors. The as-synthesized materials were subsequently annealed at different temperatures to remove residual impurities and disordered carbon and to improve the structural ordering of the carbon phase. A further reduction treatment under an Ar/H_2 atmosphere was employed to control the oxidation state of the Cu–Ni components and their interaction with the carbon structure. The evolution of morphology, crystalline phases, carbon structure, and thermal stability was systematically investigated by scanning electron microscopy (SEM), X-ray diffraction (XRD), Raman spectroscopy, and thermogravimetric analysis (TGA). The results indicate the formation of sp^2-rich graphene-like/graphitic carbon associated with Cu–Ni metallic/oxide phases, whose structural characteristics are strongly influenced by post-synthesis thermal treatment. The coexistence and interaction of conductive carbon structures with Cu–Ni-based phases provide a potentially advantageous architecture for charge transport, surface reactions, and interfacial processes. These findings demonstrate the potential of SCS as a scalable route for developing graphene/Cu–Ni hybrid materials toward applications in catalysis, optoelectronic devices, and chemical and electrochemical sensors.

Keywords: Solution combustion synthesis (SCS), Graphene-like carbon, Cu–Ni hybrid composites, Thermal treatment.

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PII-45

FABRICATION OF PERIODIC STRUCTURES ON LITHIUM NIOBATE BY TWO-BEAM PICOSECOND-LASER INTERFERENCE

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Abstract. We report the fabrication of periodic structures on lithium niobate ($LiNbO_3$) by two-beam interference of a picosecond Nd:YAG laser (λ = 355 nm, τ = 26 ps), the beam being split into the ±1 orders by a sinusoidal-phase-grating DOE on fused silica. Periodic structures form within 7.5×10^9–1.0×10^{10} W/cm² (optimal ~7.5×10^9), with complete surface damage at 1.5-1.7×10^{10} W/cm^2 (estimated threshold ~1.3×10^{10}). Period tunability over 0.6-3.4 μm was demonstrated by varying the wavelength (1064, 532, 355 nm), and a continuous periodic-structure region up to 2 mm was formed by stitched scanning. The method is promising for periodic refractive-index gratings and integrated photonic elements on lithium niobate.

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PII-46

EFFECT OF WEATHER CONDITIONS ON UAV TRACKING CAPABILITY OF SCANNING LIDAR SYSTEMS

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Abstract. Reliable counter-UAV operation depends on knowing how a scanning LIDAR tracker behaves as the weather degrades, yet scan-pattern choice has so far been studied only in clear air. We close that gap with a Monte-Carlo tracker - a constant-velocity Kalman filter with per-echo ecartometry noise, Gaussian beam-energy detection and Swerling-2 target fluctuation - calibrated against Quentel's published experiments, which it reproduces to 0.4% in static pointing noise and 3% in track-loss range. Extinction follows the Koschmieder relation scaled to 1550 nm (α = 0.10–0.60 km^{-1}). Judged by the localisation rate f_{loc} - the quantity those experiments actually measure - the four patterns separate cleanly at every attenuation, rosette > CAV spiral > Lissajous > CLV spiral, the rosette sustaining about five times the Lissajous rate in dense haze; the ordering reverses for acquisition. Adapting both pattern and power holds $f_{loc} \geq 25$ Hz at a mean 3.67 kW, so pattern choice alone is worth 37% of the worst-case power. Below 1 km visibility, however, two-way attenuation sets a hard link-budget limit that no strategy can lift.

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PII-47

DUAL-LIQUID ELLIPTICAL-CORE PHOTONIC CRYSTAL FIBER WITH HIGH BIREFRINGENCE FOR NEAR-INFRARED POLARIZATION-MAINTAINING SUPERCONTINUUM GENERATION

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Abstract. We present a numerical investigation of an optimized dual-liquid elliptical-core photonic crystal fiber with high birefringence. The design features a C_2Cl_4-filled elliptical core, ethanol-filled elliptical holes in the first cladding ring, and circular air holes in the outer fused-silica cladding, creating pronounced transverse geometrical and material anisotropy. This structure induces a significant effective-index splitting between the orthogonally polarized fundamental modes, resulting in a birefringence of 2.74×10^{-3} at the technologically relevant wavelength of 1.55 μm and a short beat length of 0.567 mm. At longer wavelengths, birefringence increases to 7.51×10^{-3} at 2.5 μm, nearing the 10^{-2} threshold, while the beat length further shortens to 0.333 mm. These characteristics underscore the fiber's suitability for polarization-maintaining transmission, fiber lasers, interferometric photonic systems, and polarization-dependent nonlinear applications such as supercontinuum generation.

Keywords: Photonic crystal fiber; birefringence; polarization-maintaining; supercontinuum generation.

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PII-48

DEVELOPMENT OF SINGLE PHOTON COUNTER BASED ON ACTIVELY QUENCHED AVALANCHE PHOTODIODE

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Abstract. Single photon detectors have been widely used in spectroscopic, remote sensing and in quantum science experiments. Avalanche photodiodes APD possess several key advantages over traditional photomultiplier detector, including higher overall quantum efficiency especially in the near infrared region. Silicon APDs are available commercially and allow the detection of single photons up to wavelength of 1 μm. Active quenching of silicon APD biased above its breakdown voltage constitutes a straightforward method to detect single photons with high sensitivity, high time resolution and at the same time minimizing the detection deadtime. Here we present a novel active quenching circuit and the results obtained with APD type C30902SH. We demonstrate the capability of our single photon detection module and measure its characteristic time resolution and detection deadtime. Our module will be useful to future quantum science experiments involving single photons.

PII-49

THE ANALYZE STRUCTURAL AND OPTICAL PROPERTIES OF Ce^{3+}, Tb^{3+} IONS CO-DOPED STRONTIUM ALUMINATE BOROTELLURITE GLASS

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Abstract. Strontium aluminate borotellurite composite glass co-doped with Ce^{3+} and Tb^{3+} ions was successfully produced by heating in a reducing environment using graphite. The amorphous structure of the glass was examined by X-ray diffraction. The optimal concentrations of doped Ce^{3+} and Tb^{3+} ions for maximum optical efficiency are both 0.75 %mol. The co-doping Ce^{3+} and Tb^{3+} ions with low concentration can reduce the optical band gap width (E_{opt}) of the borate glass matrix, while the presence of these ions also slightly increased the width of the band tail (ΔE). The Ce^{3+} and Tb^{3+} ions both act as fluorescent centers. In addition, Ce^{3+} ions also act as sensitizing centers by transferring energy via reabsorption to Tb^{3+} ions. The charge-trapping centers in the TL process originate from intrinsic defects ($(BO_3)^{2-}$ and $(O_{-v})^{-2}$) generated by irradiation. The TL glow band have the properties of Ce^{3+} and Tb^{3+} ions as a result of energy transfer from defect centers (recombination centers) to these ions. The dose-linear response is very good in the dose range of 200 cGy-2100 cGy. Fading of the TL signal is quite small, about 10.4% after 30 days of sample storage. These TLs are employed in cumulative dosimetry.

Keywords: dose-linear response; strontium borotellurite glass, storage, Thermoluminescence

PII-50

CONDENSATION DYNAMICS OF QUANTUM WELL EXCITON-POLARITON UNDER PERPENDICULAR MAGNETIC FIELD

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Abstract. In this talk, we will present a theoretical study on the variation of laser light intensity emitted from GaAs quantum wells under the influence of a magnetic field. The magnetic field is applied perpendicular to the plane of the quantum well. The results show a nonlinear increase in laser emission intensity with magnetic field strength at high excitation energies. Conversely, at low excitation energies, the magnetic field reduces the emission intensity.

PII-51

LOCALLY COUPLED PARITY–TIME-SYMMETRIC MICRORINGS: RE-ENTRANT PHASE TRANSITIONS AND NONLINEAR PROPAGATION-STABLE STATES

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Abstract. We investigate two parity–time-symmetric ring resonators coupled over a finite angular region described by a super-Gaussian profile. In the linear regime, the homogeneous- and narrow-contact limits admit analytical spectra, whereas finite-width coupling is treated numerically. Local coupling mixes angular harmonics, lifts the degeneracy of counterpropagating modes, and creates multiple exceptional-point boundaries. The resulting phase diagrams contain disconnected broken-PT domains and exhibit re-entrant unbroken–broken–unbroken transitions when the gain–loss strength, coupling width, or coupling amplitude is varied. The numerical spectra continuously recover both analytical limits. In the nonlinear regime, selected ground and excited linear modes are continued by adiabatic propagation into finite-amplitude Kerr states that remain dynamically persistent over finite nonlinear intervals. These results establish the spatial extent of coupling as an independent control parameter for PT phase transitions and nonlinear-state selection in coupled-ring systems.

PII-52

FABRICATION OF NANOSTRUCTURES ON AN Au/Pd BASED PLATFORM CaF_2 USING LOW-ENERGY FEMTOSECOND LASER PULSES

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Abstract: This study presents a method for fabricating nanostructures on Au/Pd (80/20%) alloy thin films with a thickness of 50 - 60 nm deposited on a CaF_2 substrate using low-energy femtosecond laser ablation at a wavelength of 515 nm. The influence of laser fluence on surface structure formation was investigated using scanning electron microscopy (SEM) combined with energy-dispersive X-ray spectroscopy (EDX). The results show that, as the laser fluence increased from 0.11 to 0.25 J/cm², characteristic surface features including microcones, micropillars, nanoparticles, and microholes were successively formed on the film surface. The threshold fluences for the formation of microcones and microholes were determined to be 0.10 ± 0.02 J/cm² and 0.22 ± 0.02 J/cm², respectively. Arrays of microholes with diameters ranging from 2 to 4 μm and periods of 5 to 7 μm were successfully fabricated, demonstrating their potential applications in diffraction gratings, spatial filters, and integrated photonic devices. These results confirm the effectiveness and high precision of low-energy femtosecond laser pulses for the fabrication of micro/nanostructures on plasmonic materials.

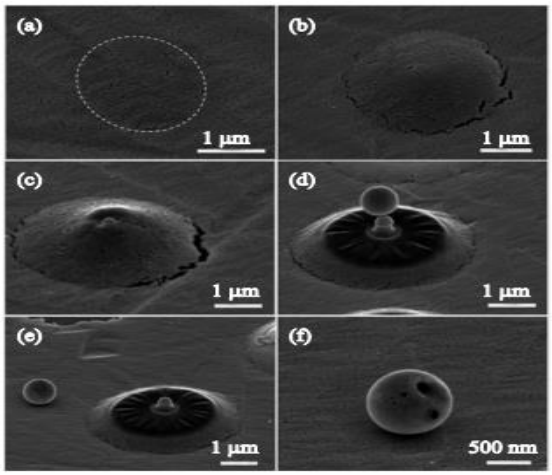

Fig. 1. *SEM images of the Au/Pd alloy film surface irradiated with femtosecond laser pulses at laser fluences of F ≈ 0.11 (a), 0.13 (b), 0.15 (c), and 0.18 (d, e, and f) J/cm².*

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SESSION POSTER III

PIII-01

ELECTRODEPOSITED Cu_2S NANOSPHERES ON ITO FOR NONENZYMATIC ELECTROCHEMICAL CHOLESTEROL SENSING

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Abstract. Elevated blood cholesterol is a leading risk factor for cardiovascular disease, yet the enzymatic sensors in routine use are costly and lose activity on storage. Copper(I) sulfide is an appealing enzyme-free alternative - an earth-abundant semiconductor with genuine electrocatalytic activity, but it is almost always prepared as a powder that must then be bound onto an electrode, a step that buries active sites and impedes electron transfer. Here, Cu_2S nanospheres are grown in a single step directly on indium tin oxide by electrodeposition from an aqueous bath, yielding a binder-free electrode that requires no post-treatment. Deposition voltage and time were found to govern film quality: outside a narrow window the film degrades, or the spheres coarsen and agglomerate, whereas the optimal condition gives uniform, densely packed spheres of about 75 nm. X-ray diffraction shows phase-pure hexagonal chalcocite Cu_2S, free of the CuS and CuO impurities that so often accompany Cu(I) chemistry. The resulting electrode responds to cholesterol in phosphate buffer with currents that rise monotonically across 0.5–1.5 mM in both voltammetric and amperometric modes, confirming electrocatalytic oxidation at the nanostructured surface. Electrodeposited Cu_2S thus offers a simple and inexpensive route to enzyme-free cholesterol electrodes.

Keywords: Cu_2S nanospheres/ITO electrode, hexagonal chalcocite Cu_2S thin film, constant-voltage two-electrode electrodeposition, thioacetamide-assisted sulfidation, deposition potential–time optimisation, nonenzymatic cholesterol biosensor, electrocatalytic cholesterol oxidation.

PIII-02

THE STIMULATED RAMAN SCATTERING OF THE 40 ps Nd:YAG LASER THIRD HARMONIC RADIATION IN THE MIXTURES OF WATER AND ETHANOL

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Abstract. Stimulated Raman scattering (SRS) is widely used to convert the generation wavelength of existing lasers into new spectral ranges. From a practical point of view, it is especially important to obtain ultrashort pulses in the UV region of the spectrum using the SRS technique. It is promising to use mixtures of inorganic and organic liquids as working media for SRS converters due to their low cost, the ability to vary the length of the interaction of the laser beam with them over a wide range, excite the SRS simultaneously at several vibrational transitions of the liquid molecules of the mixture, and the rapid (≤ 1 ps [1]) restoration of their molecular structure after optical breakdown. In this work, for the first time to our knowledge, the SRS-conversion of the Nd:YAG laser third harmonic radiation (355 nm, 0.7 mrad, 40 ps, 15 Hz, 8 mJ) in the mixture of water and ethanol has been studied. Raman gain coefficients of water and ethanol differ by almost 2 times [1,2]. It makes possible, by changing the concentration of the mixture components, to control the intensities of various Stokes components in the obtained spectrum of SRS converted radiation. In the experiments, a 30 cm long quartz cuvette with the mixture of water and ethanol in a volume ratio of 50:50 (1) or 75:25 (2) was used. The laser radiation was focused into the cuvette by a lens with a focal length of 50 cm. Focal waist length reached half the length of the cuvette. The exciting radiation intensity at the maximum energy of laser pulses was about 30 TW/cm2. The Stokes pulses energies versus the pumping laser pulses energies and the spectra of the SRS radiation at different concentrations of water and ethanol in the mixture have been measured. For mixture (1), two Stokes components from ethanol at 396 nm and 448 nm have been recorded in the spectrum. The excitation thresholds for the energy (intensity) of laser radiation for these components were 14.5 μJ (about 80 GW/cm^2) and 150 μJ (about 800 GW/cm2), respectively. The maximum value of the energy efficiency for the generation of the first Stokes component reached 65 %. During the transition to mixture (2), two ethanol-based Stokes components (396 nm, 448 nm) and one water-based component (404 nm) were generated. By this, the energy efficiency of generating the first Stokes component of ethanol reached 60 %.

These results have been obtained as a part of joint Belarussian-Vietnamese project funded by BRFFR (F25VA-004) and VAST (QTBY02.01/26-27), and was partially sponsored by the State Program of Scientific Research of Belarus “Photonics and Microelectronics” (task 5.1.01).

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PIII-03

EFFECT OF HYDROTHERMAL TEMPERATURE ON THE PHOTOELECTROCHEMICAL PROPERTIES OF α–Fe_2O_3 NANORODS ON FTO

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Abstract. Hematite (α–Fe_2O_3) is a promising semiconductor material for photoelectrochemical applications owing to its chemical stability, natural abundance, and suitable band gap [1, 2]. In this study, α–Fe_2O_3 nanorods were directly grown on FTO substrates via a hydrothermal method using $FeCl_3.6H_2O$ and urea as precursors with a urea/$FeCl_3$ molar ratio of 1.25:1. The effect of hydrothermal temperature on the structural, optical, and photoelectrochemical properties was investigated at a fixed reaction time of 10 h. The samples were subsequently annealed at 550°C for 1 h, followed by rapid annealing at 700°C for 10 min. The structural, morphological, and optical properties of the materials were characterized by Raman spectroscopy, SEM image, and UV–Vis spectroscopy. Photoelectrochemical measurements showed that the sample synthesized at 120°C exhibited the highest photocurrent density of 0.66 mA cm^{-1} at 1.23 V vs. RHE under illumination, which was 13.2 times higher than the dark current density (0.05 mA cm^{-2}). These results demonstrate that hydrothermal temperature plays an important role in determining the photoelectrochemical properties of α–Fe_2O_3 nanorod photoelectrodes, with 120°C providing the optimal performance under the investigated conditions.

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PIII-04

RAMANPEAKMATCHINGFORCOMPONENTDETECTION IN COMPOUNDS

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Abstract. Telling whether a given substance is present in a mixture, such as ethanol in a sanitiser or an acetate ester in a solvent blend, is a practical everyday need that Raman li brary search does not answer. Until recently no algorithm could do this; data-driven analysis of spectral databases now makes it feasible. Hit-quality-index search [1] fails for molecules absent from the library, group-frequency tables [2] do not say which bands of a component survive bonding, and deep-learning classifiers need thousands of labelled spectra. Here we build a component presence score from the parent's own peak list without training: bands shared by at least half of the other library compounds are discarded, each spectral region of the query is scaled to its own maximum, and the score is the weighted sum, over the retained parent bands, of the largest query intensity found within ±25cm−1 of each band; each weight is the band's separating power on one to three known compounds containing it, measured as AUROC − 0.5, where AUROC is the area under the receiver-operating characteristic curve (1 = perfect separation, 0.5 = chance). Two reaction triads, ethanol + acetic acid → ethyl acetate and methanol + tert-butanol → MTBE, were evaluated on a public 785nm set of 31 solvents and reagents [3] under strict leave-one-compound-out. The strongest parent bands shift by 25–70cm−1 on bonding, so intensity-weighted match ing reaches only AUROC 0.71–0.93, whereas the weak δ(OCO) band at 622–634cm−1 alone separates acetate esters with AUROC 0.98. Transferability weighting raises acetate detection to AUROC 0.99, all three acetate esters being detected at 5% false alarm, and keeps 0.95 under a twofold fluorescence background at peak SNR 10. The score needs only a peak list and a few reference compounds, making component-level screening feasible where the product has no library entry.

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PIII-05

WHEN DOES A PHOTONIC QUANTUM RESERVOIR HELP? A FALSIFIABLE BENCHMARK FOR FEW-LABEL INDUSTRIAL DEFECT CLASSIFICATION

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Abstract. Photonic quantum reservoirs can generate nonlinear feature maps without training the optical circuit [1], but their practical value under severe label constraints remains uncertain. This study evaluates a fixed six-mode, two-photon photonic reservoir for six-class industrial surface-defect classification on the NEU-CLS dataset [2]. Images are encoded with frozen OpenCLIP ViT-B/32 features [5], followed by L2 normalization and train-only PCA to five dimensions. The fixed U D(x) U circuit maps each sample to 15 conditional collision-free probabilities using Perceval [3], and only a logistic readout is trained. Following matched-baseline benchmarking principles [4], evaluation uses 12, 24, and 48 labels per class, five duplicate-safe outer folds, three subset seeds, and three photonic-map seeds. At 48 labels per class, Photonic Q1 achieved a mean Macro-F1 of 0.8738 ± 0.0146. It exceeded the width-matched RFF-15 baseline (0.6543 ± 0.0138) on every fold, but remained below ELM-15 (0.8968 ± 0.0116) and PCA-5 RBF-SVM (0.9137 ± 0.0079). Measurement ablations showed that adding acceptance information or all 21 Fock outcomes changed mean Macro-F1 by less than 0.004, whereas bunched-only outcomes reduced performance. In an exploratory Fold-0 finite-shot extension, performance approached the matched ideal by 1,000 launched shots per image and showed diminishing returns beyond 2,000. These results indicate that the fixed photonic map preserves useful nonlinear signal, but its utility remains below strong compact classical baselines under the present protocol. The evidence is limited to one dataset and ideal simulation; no hardware or quantum-advantage claim is made.

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PIII-06

ENGINEERING HIERARCHICAL Sn GAS-DIFFUSION ELECTRODES FOR EFFICIENT CO_2-TO-FORMATE CONVERSION AT HIGH CURRENT DENSITIES

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Abstract. Developing gas-diffusion electrodes that can sustain efficient CO_2 electroreduction to value-added products at high current densities is critical for advancing practical applications. In this study, Sn-based gas-diffusion electrodes were directly fabricated by electrodeposition Sn catalyst onto a porous gas-diffusion layer (GDL). The nucleation and growth of Sn catalyst were systematically controlled by varying deposition time and Sn^{2+} precursor concentration. Deposition times ranging from 30 to 240 s produced pronounced changes in morphology and electrochemical performance. An optimal deposition time of 180 s yielded a hierarchical, fern-like Sn architecture with a highly accessible electrochemical surface, resulting in enhanced CO_2 reduction selectivity in a 0.1 M $KHCO_3$ electrolyte in H-cell. Further optimization of the Sn^{2+} precursor concentration identified 20 mM as the most effective condition for promoting formate formation.

In a flow-cell electrolyzer with 1.0 M KOH, the optimized Sn/GDL electrode achieved a formate Faradaic efficiency of 87% at a current density of 200 $mA.cm^{-2}$ and maintained stable product selectivity for 6 h of continuous electrolysis. The enhanced CO_2-to-formate performance is attributed to the optimized hierarchical Sn morphology, which provides abundant electrochemically accessible active sites. These results demonstrate that rational control of electrodeposition parameters offers a simple and effective strategy for constructing efficient Sn gas-diffusion cathodes for selective CO_2 electroreduction to formate.

PIII-07

DEVELOPMENT OF AN Fe_3O_4/Nafion-MODIFIED ELECTROCHEMICAL SENSOR FOR THE RAPID DETECTION OF METRONIDAZOLE ANTIBIOTIC RESIDUES IN FOOD SAMPLES

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Abstract. The presence of metronidazole (MTZ) antibiotic residues in food necessitates the development of rapid and low-cost screening methods. In this work, Fe_3O_4, $MnFe_2O_4$, and $ZnFe_2O_4$ magnetic nanoparticles were hydrothermally synthesized at pH 10 and 150 °C, and subsequently used to modify working electrode of commercial Metrohm DropSens 110 screen-printed carbon electrode (SPCE). Cyclic voltammetry and electrochemical impedance spectroscopy revealed that Fe_3O_4 exhibited the most pronounced signal enhancement. Relative to the bare SPCE, the Fe_3O_4-modified working electrode (Fe_3O_4/Nafion/SPCE) exhibited an increase in electrochemically active surface area from 0.235 to 0.322 cm^2 and a decrease in charge-transfer resistance R_{ct} from 25 to 14 Ω. To improve coating adhesion and stability, Fe_3O_4 was firstly ultrasonically dispersed in a 0.5% Nafion-containing medium, then drop-cast directly onto the working electrode, and dried at 55 ˚C for 2 hours. The result shows that the Fe_3O_4/Nafion/SPCE retained an active area of 0.298 cm^2 and R_{ct} = 18 Ω. Under optimized conditions, differential pulse voltammetry measurements in 0.1 M phosphate-buffered saline (pH 7) at 50 s accumulation time produced a linear cathodic response within the concentration range of 0.01 to 100 µM. Notably, a measurable cathodic response was obtained at the lowest tested MTZ concentration of 5 nM. The calculated limits of detection and quantification were 0.0071µM and 0.0235 µM, respectively, with a sensitivity of 24.23 $\mu M^{-1} \cdot cm^{-2}$. The sensor demonstrated high reproducibility, with a relative standard deviation (RSD) of 2.87% over 20 consecutive measurements at 50 µM. The modified working electrode remained electrochemically active after 300 continuous CV cycles at 50 $mV \cdot s^{-1}$. Furthermore, spike-recovery analysis yielded satisfactory recoveries of 92.34%–105.23% in milk and 99.28%–100.77% in pork. These results demonstrate that the Fe_3O_4/Nafion-modified sensor exhibits enhanced electrochemical signals, improved sensor durability, and great potential for detecting MTZ antibiotic residues at low concentrations in food samples.

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PIII-08

EVALUATION OF THE EFFECTIVENESS OF USING AMPHOTERICIN B AS A PHOTOSENSITIZER FOR COMBATING BACTERIAL-FUNGAL INFECTIONS

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Abstract. Pathogen resistance to antibiotics requires new therapeutic approaches. Photodynamic therapy using antibiotics as photosensitizers that generate reactive oxygen species (ROS) is promising. Advantages include lack of microbial resistance to oxidative damage and the use of antifungals like amphotericin B for mixed infections.

Objective. To evaluate amphotericin B as a photosensitizer on *Escherichia coli* M-17 and *Candida albicans* 10231.

Materials and Methods. Photodynamic action was studied under laser irradiation at 403–407 nm. ROS contribution was determined by chemiluminescence using specific quenchers (sodium azide, sodium pyruvate, mannitol).

Results. For *E. coli*, dark toxicity of amphotericin B (2.5–10 mg/L) over 40 min was 71.2–95.0 %, irradiation (65–130 mW/cm²) inactivated 73.3–98.7 %. Combination (10 mg/L, 65 mW/cm², 403 nm) reduced titer by 98.2 % in 10 min. For *C. albicans*, dark toxicity (5–15 mg/L) over 60 min was 34.2–49.9 %, irradiation (50 mW/cm²) inactivated 93.4 %, combined treatment achieved 100 % fungal death. In mixed culture (10 mg/L, 100 mW/cm², 403 nm), inactivation of *C. albicans* after 30 min was 93.4 %, *E. coli* – 66.5 %; by 60 min complete death of both occurred. Quenchers identified singlet oxygen as the primary photodamaging agent; hydroxyl radicals and hydrogen peroxide contributed negligibly.

Conclusion. Amphotericin B is effective as a photosensitizer for antimicrobial photodynamic therapy. ROS generation under blue light enhances bactericidal and fungicidal action, overcomes fungal resistance, and extends activity to bacterial infections. Optimized parameters (403–407 nm, 10–15 mg/L, 50–65 mW/cm²) provide a basis for treating mixed infections.

PIII-09

INFLUENCE OF SUPPLEMENTAL LED LIGHT INTENSITIES ON PLANT GROWTH AND THE ANTIMICROBIAL AND ANTIOXIDANT ACTIVITIES OF *Perilla frutescens* ESSENTIAL OIL

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Abstract. This study evaluated the effects of supplemental LED lighting dosages on the biomass, essential oil, and antimicrobial and antioxidant activities of *Perilla frutescens* (L.) Britton plants grown in Hanoi, Vietnam. The plants were cultivated for approximately 21 weeks under three supplemental lighting regimes—sharing the same spectral composition (B:R:Fr = 44.40:50.62:4.98) and a 6 $h \cdot d^{-1}$ supplemental duration but differing in photosynthetic photon flux density (100, 120, or 140 $\mu mol \cdot m^{-2} \cdot s^{-1}$)—alongside a control treatment. Gas chromatography-mass spectrometry combined with a flame ionization detector (GC/MS-FID) identified four major components in the essential oil: limonene (13.0–18.1%), perilla aldehyde (22.6–31.4%), (*E*)-*β*-caryophyllene (12.3–16.4%), and germacrene D (6.6–11.3%). Supplemental lighting significantly influenced biomass accumulation and essential oil yield ($p < 0.01$). Among the treatments, F6 (120 $\mu mol \cdot m^{-2} \cdot s^{-1}$) yielded the best results regarding plant height, fresh and dry shoot biomass, and essential oil yield; these metrics increased by factors of 1.10, 1.93, 1.31, and 1.83, respectively, compared to the control plants grown under sunlight alone. However, the perilla aldehyde content (31.4%) in the essential oil peaked in treatment F5 (100 $\mu mol \cdot m^{-2} \cdot s^{-1}$), representing a 1.11-fold increase over the control. Notably, this study provides the first data demonstrating that adjusting the intensity of supplemental LED lighting can influence the antimicrobial and antioxidant activities of *P. frutescens* essential oil. These results indicate that optimizing LED light dosage can enhance the yield and/or functional quality of *P. frutescens*, thereby offering a promising strategy for the controlled cultivation of medicinal plants to improve their bioactive properties.

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PIII-10

CuO LOADING-DEPENDENT STRUCTURE-ACTIVITY RELATIONSHIPS IN CuO/TiO_2 PHOTOCATALYSTS FOR SINGLE- AND MULTICOMPONENT POLLUTANT DEGRADATION UNDER VISIBLE-LIGHT IRRADIATION

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Abstract. CuO/TiO_2 composites with systematically varied nominal CuO loadings were investigated to establish composition-structure-optical-photocatalytic relationships and to identify an optimum formulation for visible-light pollutant degradation. The materials were characterized by scanning electron microscopy, X-ray diffraction, Raman spectroscopy, and UV-Vis spectroscopy. Increasing CuO loading produced nonmonotonic changes in TiO_2 crystallite size and Raman-band position/width while progressively modifying the visible light absorption response. These descriptors did not exhibit a simple monotonic relationship with photocatalytic activity. Under Xe-lamp irradiation equipped with a 400 nm cutoff filter ($\lambda >$ 400 nm), $CuO_{5\%}/TiO_2$ showed the highest activity toward single-solute rhodamine B (RhB), with an apparent pseudo-firstorder rate constant of approximately 0.048 min^{-1}, despite having neither the smallest TiO_2 crystallite size nor the strongest visible-light absorption. The optimized composition was subsequently evaluated in a four-component system containing ciprofloxacin (CIP), methyl orange (MO), methylene blue (MB), and RhB, each at 10 mg/L. Apparent rate constants of approximately 0.01797, 0.01475, 0.01226, and 0.00554 min^{-1} were obtained for CIP, MO, MB, and RhB, respectively. The RhB rate in the multicomponent system was approximately 8.6-fold lower than in the corresponding single-solute experiment, revealing a pronounced matrix-associated suppression. $CuO_{5\%}/TiO_2$ retained approximately 85% of its initial RhB degradation performance after five reuse cycles, while scavenger tests showed pollutant-dependent inhibition behavior. Overall, the results indicate that the optimum photocatalytic response arises from a composition dependent balance of structural and optical characteristics rather than from CuO loading, crystallite-size minimization, or visible-light absorption alone.

PIII-11

PEDOT:PSS-DWCNT COMPOSITE HOLE-SELECTIVE LAYERS FOR HIGH-PERFORMANCE ORGANIC–SILICON HYBRID HETEROJUNCTION SOLAR CELLS

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Abstract. Herein, we present a simple and solution-based approach to combine the advantages of poly(3,4-ethylenedioxythiophene) (styrenesulfonate) (PEDOT) and double-walled carbon nanotubes (DWCNTs) by developing a PEDOT composite film for application as a hole-selective layer (HSL) in organic–silicon hybrid heterojunction solar cells. The effect of DWCNT content on the photovoltaic performance of the prepared devices was systematically investigated. The pristine PEDOT/Si device exhibited a power conversion efficiency (η) of 5.82% with an open-circuit voltage (V_{oc}) of 484 mV. Upon incorporation of DWCNTs, the photovoltaic performance was significantly improved, demonstrating the beneficial role of the carbon nanotube network in charge transport and collection. The optimized PEDOT HSL-based heterojunction solar cell achieved a remarkable V_{oc} of 512.6 mV, a short-circuit current density (J_{sc} >) of 25.13 mA cm^{-2}, and a fill factor (FF) of 59.01%, resulting in a power conversion efficiency of 7.35%. The enhanced photovoltaic performance is attributed to the improved electrical conductivity and hole-transport pathways provided by the DWCNTs, together with the formation of a stronger inversion layer in the silicon substrate. These effects facilitate photogenerated carrier separation and extraction at the PEDOT/Si interface, thereby reducing charge-transport losses and improving the overall device performance. The results demonstrate that incorporating DWCNTs into PEDOT is an effective strategy for enhancing the performance of organic–silicon hybrid solar cells through a simple solution-processing route. Furthermore, owing to its solution processability and favorable electrical properties, the PEDOT composite film holds considerable potential for application in flexible organic and perovskite photovoltaic devices.

Keywords: PEDOT:PSS, Double-walled carbon nanotubes (DWCNTs), Organic–silicon hybrid solar cells, photovoltaic devices.

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PIII-12

SCHOTTKY CONTACT ENGINEERING IN Ta_2B MBene/JANUS MoSSe HETEROSTRUCTURES FOR ADVANCED OPTOELECTRONIC APPLICATIONS

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Abstract. Recently, metal-semiconductor van der Waals heterostructures provide an attractive platform for tailoring interfacial electronic properties and optimizing carrier injection in nanoscale devices. Here, we employ first-principles calculations to explore the structural stability, mechanical behavior, electronic characteristics, and metal-semiconductor contact properties of 1T- and 2H-Ta_2B/MoSSe heterostructures with different interfacial stacking configurations [1]. The calculations reveal that the considered heterostructures are energetically favorable and dynamically and mechanically stable, while the two constituent monolayers are primarily coupled through weak van der Waals interactions. Such interlayer bonding preserves the structural integrity of the interfaces and may facilitate experimental fabrication and exfoliation. Importantly, all investigated stacking configurations exhibit n-type Schottky contacts, demonstrating that the interfacial electronic properties can be modulated through stacking engineering. The metallic Ta_2B layer consistently favors electron injection into the MoSSe semiconductor, irrespective of whether it is placed on the S- or Se-terminated surface. In addition, the heterostructures possess relatively low contact resistance, indicating efficient electron transport across the metal–semiconductor interface. These results demonstrate that stacking-dependent interface engineering offers an effective route for controlling carrier injection in Ta_2B/MoSSe heterostructures and highlight their potential for nanoscale electronic and optoelectronic applications.

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Keywords: 2D van der Waals heterostructures; Contact engineering; Schottky barrier; Ohmic contact; First-principles design.

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PIII-13

FeNdB MAGNETIC NANOPARTICLES FABRICATION AND THEIR APPLICATIONS IN SERS SENSOR USING PULSED LASER ABLATION TECHNOLOGY

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Abstract. Magnetic nanoparticles have been the focus of many researches recently because of their attractive properties which could see potential use in catalysis including nanomaterial-based catalysts, biomedicine and tissue specific targeting, magnetically tunable colloidal photonic crystals, microfluidics etc… Using Pulsed laser ablation (PLA) technology, we have successfully synthesized FeNdB magnetic nanoparticles in deionized water. The FeNdB nanoparticles' magnetic properties have been measured and proven to be effective in assisting SERS sensors which fabricated using metal nanoparticles synthesized via PLA. The result are presented in this report.

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PIII-14

SYNTHESIS OF NITROGEN AND NICKEL CO-DOPED CARBON QUANTUM DOTS FOR BIOSENSOR APPLICATIONS

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Abstract. In this work, we synthesized carbon quantum dots co-doped with nitrogen and nickel (N, Ni-CDs) through a simple and green one-step hydrothermal method. The simultaneous incorporation of N and Ni dopants into the carbon framework modifies the electronic structure and enhances the luminescent properties of the material. The results of UV-Vis, PL, TRPL, FTIR and Raman analysis demonstrate that nitrogen contributes to the passivation of defect traps and to the adjustment of the surface state, while nickel is mainly coordinated on the surface and affects the distribution of electronic density. The doping of N and Ni which is responsible for the presence of functional groups helps to improve the fluorescence emission without disturbing the carbon core structure. The N, Ni-CDs material, in particular, has great potential in the preparation of sensors for the detection of the antibiotic Tetracycline (TC) through the mechanism of static fluorescence quenching due to the resonance effect between N and Ni. The results lay the basis for further research on the effect of co-doping N/Ni on the properties of CDs and confirm the potential application of the material in biosensors.

PIII-15

UNI- AND MULTIVARIATE UPCONVERSION FLUORESCENCE THERMOMETRY WITH ERBIUM AND YTTERBIUM-DOPED ALUMINOFLUORIDE GLASSES

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Abstract. Temperature is a fundamental physical quantity widely practiced in all areas of human activity. Non-contact optical thermometry based on the fluorescence intensity ratio (FIR) [1] has been rapidly developing. Significant attention has been paid to rare earth ions, which exhibit upconversion fluorescence (UCF). The most extensively studied rare-earth ion is Er3+ [2], which in aluminofluoride glasses exhibits two green UCF bands (490-560 nm) and one red band (615-680 nm), which arise from transitions from the ther mally coupled energy levels 2H11/2 and 4S3/2 and the 4F9/2 level, respectively. The aim of the present work is to investigate the possibility of increasing the relative sensitivity Sr of fluorescence thermometry and reducing the uncertainty of the temperature estimation compared to the univariate FIR technique. This is achieved by applying principal compo nents analysis (PCA) [3], support vector regression (SVR) [4] and partial least squares (PLS) [5] to the UCF spectra of four Yb3+ and Er3+ co-doped aluminofluoride glasses. Fluorescence emission was recorded with a resolution of ~1 nm in the temperature range of 30–105 oC with a reference measurement uncertainty of 0.1 oC. The pump power at a wavelength near 960 nm was adjusted to achieve maximum UCF intensity of ~1500 arb.u. at room temperature, varying from 0.19 to 0.49 W depending on the sample. The UCF spectra were normalized to their maximum intensity. After removing measurement outliers, PCA was found to be superior to the FIR technique in terms of Sr. For the glass doped with 0.1 mol.% Er3+, 2 mol.% Yb3, Sr = 0.6 % K-1 for FIR at 34 oC, whereas Sr = 2.8 % K-1 for PCA. Two additional figures of merit, root mean square error (RMSE) and temperature uncertainty or mean absolute error (MAE), are used to compare univariate and multivariate models. For example, for the glass doped with 0.1 mol.% Er3+ and 10 mol.% Yb3+, RMSEPLS = 0.52 K and RMSESVR = 2.24 K. This indicates that linear calibration outperforms nonlinear one for Er3+ UCF thermometry. Spectral variable selection for PLS was performed using the search combination moving window interval (scmwi) method [7]. MAEscmwiPLS for the glass doped with 0.1 mol.% Er3+ and 4 mol.% Yb3+ is 0.11 K, compared to 1.02 K for the FIR. Thus, the application of machine learning methods to the UCF spectra of Er3+ in aluminofluoride glasses demostrates the high potential of multivariate thermometry.

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PIII-16

CALIBRATING THE COMPOSITION OF BILLON ALLOYS BY LIBS AND MACHINE LEARNING METHODS WITH SPECTRAL VARIABLES SELECTION

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Abstract. When studying metal historical artifacts, close attention is currently paid to the composition of the objects under study [1]. Billon alloys are most commonly encountered among the artifacts. They consist mainly of copper and silver. The aim of this study is to develop a reference method for determining the stratigraphic dependence of the composition of historical artifacts by applying machine learning methods to laser emission spectra of billon alloys under quasi-nondestructive conditions. LIBS spectra of 13 reference copper-silver alloys simulating billon artifacts were recorded in the wavelength range of 336.6–892.7 nm with a step of approximately 0.3 nm. To these spectra, divided into training and validation subsets, partial least squares linear regression PLS [2] and nonlinear support vector regression SVR [3] were applied with the spectral variables selection by successive projection algorithm SPA [4], interval simulated annealing algorithm iSA [5] and search combination moving window interval scmwi [6] method. The root mean square error RMSE of the copper concentration prediction in the copper-silver standards of the validation subset is used as a figure of merit for machine learning models. The minimum RMSE for the PLS+SPA model is 3.8%, while for SVR+SPA it is 2.6%. Almost all spectral variables selected in the multivariable models are located near characteristic spectral features. The minimum RMSE for the PLS+iSA model is 2.7% and corresponds to applying the PLS method to a set of 18 intervals with 64 variables each. Calibration using the SVR+iSA method is characterized by a higher RMSE of 3.1%, which is achieved by selecting 1280 variables. The minimum RMSE for the scmwiSVR model is 0.2% and is achieved using 65 windows or 260 spectral variables, while for scmwiPLS it is 0.1% when considering 142 windows or 568 variables. Using the scmwi method allowed us to reduce the standard deviations in prediction by more than an order of magnitude compared to all other models considered. The achieved accuracy of copper and silver concentration prediction by machine learning methods based on LIBS data is sufficient to find stratigraphic dependencies of the composition of artifacts with high spatial resolution and minimal damage to the research object and will allow obtaining objective information about metal artifacts.

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PIII-17

BLUE UPCONVERSION FLUORESCENCE AND LOW DIVERGENCE RADIATION IN Tm^{3+} AND Yb^{3+} -CODOPED ALUMOFLUORIDE GLASSES WITH LOW PHOSPHATE CONTENT

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Abstract. The Tm^{3+} and Yb^{3+} codoped glasses are widely used for the development of fluorescence temperature sensors based on up-conversion (UC) process [1, 2]. A novel low phosphate alumofluoride glass has been developed to combine the best characteristics of phosphate and fluoride glasses. This glass exhibits high UC properties and is promising for use in thermometry and for laser generation on para rare-earth elements, for example, Ho-Yb [3] and Er-Yb [4]. Recently, dependence of UC excitation mechanisms of Tm^{3+} ions on the concentration of Yb^{3+} ions in such glass were studied by pumped nanosecond laser pulses at 975 nm [5]. In this work, we investigated and compared properties of blue UC florescence and blue UC radiation beam in the low-phosphate alumofluoride glasses with Tm^{3+} (0.1 mol.%) and variable Yb^{3+} ions concentration with CW pumping at 975 nm. Log-log dependences of the blue UC radiations power of Tm^{3+} ions on the pump power exciting of Yb^{3+} ions were analyzed. It was found that with an increase in the concentration of Yb3+ ions the excitation mechanism of blue UC fluorescence is differed from one of the blue UC low divergence radiation. For UC fluorescence the population of the 1G4 level changes between sequential energy transfer by Yb^{3+} ions and cooperative energy transfer (CET) from Yb-Yb* dimers, while the low divergence radiation always matches CET process. Also the results of the study of the energy and spatial characteristics of the UC low divergence radiation in depend on Yb3+ ions concentration and sample thickness are discussed.

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PIII-18

NUMERICAL MODELING AND EXPERIMENTAL CHARACTERISTICS OF A POWERFUL RING OPO RADIATION

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Abstract. This paper discusses the results of numerical modeling of the energy (Es) and temporal (τs) characteristics of the output radiation pulses of the signal wave in a three-mirror single-resonator parametric light generator, depending on the parameters of the mirrors and the number of crystals, the pump pulse energy (Ep), and the spatial distribution of the pump radiation. It has been calculated for KTA crystal 10 x 10 x 20 mm3 that at Ep = 0.5 J and pump beam diameter of 7 mm the intracavity pump radiation intensity Ip is ≈ 86.6 MW/cm2. Higher pump energy and lower beam diameter lead in destruction of the crystal. The numerical modeling results for the pump pulse energies in the range from 0.1 J to 0.5 J showed that the energy of the signal wave (λS = 1.53 μm) ES increases with the number of crystals in the resonator. However ES depends most on the Q factor of the OPO cavity with only one crystal. If the reflection coefficient RS of the output mirror at signal wavelength equals 40%, ES increases linearly at Ep > 0.2 J. ES grows more slowly at RS = 70%. At the same time, the rapid growth of ES for Rs = 50% begins to slow down at Ep ≈ 0.3 J. This Es behavior with increasing cavity Q factor is caused by an increase in the intracavity intensity, leading to the growth in the thermal load on the crystal and a decrease in the fraction of the crystal length involved in amplifying the converted signal. The shape of the depleted pump pulse indicates the threshold nature of the OPO process under non-critical synchronism conditions [1]. It demonstrates the presence of inverse conversion of signal wave to pump, appeared at the trailing edge of signal pulse. It limits the output pulse duration. With increasing Ep and cavity Q factor the inverse conversion decreases and shifts from the trailing edge to the central part of the signal pulse. The good accordance of experimental results and numerical modeling data for one-crystal OPO is obtained.

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PIII-19

RELIABILITY LIMITS OF MULTIFRACTAL INFRARED CAMOUFLAGE EVALUATION UNDER PSF/MTF BLUR, NOISE, AND TARGET SAMPLING

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Abstract. A multifractal infrared camouflage score may vary with the imaging chain even when the physical scene is unchanged. We quantified this measurement sensitivity using eight long-wave infrared armored-vehicle scenes from the TNO Image Fusion Dataset. Target and eight matched-background regions were analyzed with a differential box-counting multifractal spectrum and a Pearson spectral-correlation score. The detector-plane target sampling was varied from 32 to 128 pixels; an incremental Gaussian point-spread function (PSF) with standard deviation 0–2.25 pixels and additive Gaussian noise with standard deviation 0–0.05 of the normalized range were applied. Five Monte Carlo realizations yielded 3,200 evaluations. Reliability required median absolute score error ≤ 0.05, median repeat standard deviation ≤ 0.03, and Spearman rank correlation with the clean-scene ordering ≥ 0.80. Only 5 of 80 aggregated conditions met all three criteria, all without added degradation. Mild blur/noise produced a median absolute error of 0.099 and rank correlation of 0.667; severe degradation produced 0.147 and −0.119, respectively. Noise had the largest main-effect error range, followed by PSF and target sampling. Severe noise could give a small repeat variance while reversing the scene ordering, showing that repeatability alone does not certify a reliable camouflage ranking. The study provides an auditable, computationally inexpensive protocol for defining an imaging-quality envelope, while explicitly avoiding claims of perceptual accuracy because TNO has no camouflage ground truth.

Keywords: infrared camouflage; multifractal spectrum; PSF/MTF; image noise; target sampling; reliability.

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PIII-20

INFLUENCE OF SPATIAL RESOLUTION AND SPECTRAL BAND ON THE DETECTABILITY OF CAMOUFLAGED PERSONNEL IN MULTISPECTRAL IMAGERY

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Abstract. Camouflaged-person detectability depends on both spectral band and spatial resolution. This study quantifies their interaction using the public eXtended Multispectral Dataset for Camouflage Detection (MUDCAD-X), comprising 873 valid green- and yellow-uniform personnel cases from 654 pixel-aligned airborne scenes acquired across three seasons. VIS, Blue (475 nm), Green (560 nm), Red (668 nm), edge infrared (717 nm), NIR (842 nm), LWIR (10.5 μm), and a training-free NIR+LWIR fusion were evaluated at 10, 20, 30, and 40 cm/pixel. Lower-resolution imagery was generated by Gaussian point-spread filtering and area downsampling. Detectability was quantified using a robust local anomaly ROC-AUC within a target-centered background annulus, complemented by visibility, signal-to-clutter, and contrast-to-noise metrics. Statistical significance was assessed using bootstrap confidence intervals, Friedman tests, and Holm-corrected Wilcoxon comparisons. NIR+LWIR achieved the highest mean AUC at 10–30 cm/pixel (0.825, 0.806, and 0.792), whereas Blue ranked first at 40 cm/pixel (0.789). LWIR remained comparatively stable across resolution degradation (0.794–0.783), while VIS and NIR declined substantially. Modality effects were significant at all GSDs, and both LWIR and fusion consistently outperformed VIS. Seasonal and uniform-dependent variations further showed that no single band is universally optimal. These results demonstrate that thermal and selected narrow visible bands can mitigate moderate spatial degradation, supporting joint spectral–spatial optimization for compact multispectral reconnaissance systems.

Keywords: camouflage detection; multispectral imagery; spatial resolution; spectral band; LWIR; ROC-AUC; MUDCAD-X.

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PIII-21

OPTICAL-RESOLUTION-AWARE CAMOUFLAGE EFFECTIVENESS EVALUATION USING FREQUENCY-WEIGHTED MULTI-SCALE IMAGE FEATURES

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Abstract. Objective image-based camouflage metrics commonly ignore the resolution loss introduced by the observation optics. We propose an optical-resolution-aware camouflage similarity index combining spatially weighted CIELAB brightness, CIEDE2000 color, and frequency-weighted multi-scale Gabor texture features. Ten annotated scenes were selected from the public COD10K dataset and normalized to 1024 × 768 pixels. Isotropic Gaussian point-spread functions with σ = 0, 1, 2, and 4 pixels produced 40 controlled images. A local background ring was weighted by distance from the known target boundary, while texture was analyzed at three spatial frequencies and four orientations. Distance-to-similarity scales were fixed from the undegraded scenes without observer-score fitting. The proposed score increased from 0.4465 ± 0.2087 to 0.4637 ± 0.2077 between σ = 0 and 4 pixels, a relative increase of 3.86%. A Friedman repeated-measures test confirmed a strong PSF-level effect (χ^2 = 28.92, p = 2.33 × 10^{-6}, Kendall W = 0.964), and all ten scenes showed positive score slopes. Feature extraction required 91.5 s on a CPU-only computer. These results show that optical degradation can systematically bias camouflage evaluation; PSF and spatial sampling should therefore be controlled or reported when comparing camouflage schemes.

Keywords: camouflage effectiveness, optical resolution, point spread function, CIEDE2000, Gabor texture.

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PIII-22

STUDY ON THE PHOTOCATALYTIC DEGRADATION OF RHODAMINE B (RhB) BY CARBON QUANTUM DOTS (CQDS) AND N,S-CODOPED (N,S-CQDS)

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Abstract. This report presents the results of an evaluation regarding the photocatalytic degradation of Rhodamine B (RhB) using carbon quantum dots (CQDs) and N,S-codoped carbon quantum dots (N,S-CQDs) under visible light irradiation. RhB concentration was determined by measuring the characteristic absorbance intensity at approximately 554 nm. The results showed a gradual decrease in RhB absorbance intensity over the irradiation time, indicating that photocatalytic degradation was taking place. For CQDs, RhB degradation efficiencies reached 41.04%, 68.37%, 82.52%, and 90.86% after 20, 40, 60, and 80 minutes, respectively. For N,S-CQDs, the efficiencies reached 15.17%, 37.55%, 57.24%, and 76.33%. The photocatalytic mechanism involves the generation of electron-hole pairs and reactive oxygen species, such as •OH radicals, which contribute to the breakdown of the RhB molecular structure.

Keywords: Rhodamine B; photocatalysis; carbon quantum dots; N,S-CQDs; visible light; UV-Vis; dye degradation.

PIII-23

SYNTHESIS, STRUCTURAL CHARACTERIZATION AND OPTICAL PROPERTIES OF Tb^3-DOPED MgF_2 NANOCRYSTALS

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Abstract. Tb^{3+}-doped MgF_2 nanocrystals (NCs) were synthesized by a facile wet-chemical precipitation method and investigated in terms of their structural, morphological, compositional, and optical properties. XRD results confirmed the formation of phase-pure tetragonal rutile-type MgF_2, with diffraction peaks shifting slightly toward lower 2θ angles as the Tb^{3+} concentration increased, indicating lattice expansion due to Tb^{3+} incorporation. TEM images revealed nearly spherical NCs with particle sizes mainly in the range of 10–25 nm, while EDX analysis verified the presence of Mg, F, and Tb elements in the doped samples. Under 380 nm excitation, the MgF_2:Tb^{3+} NCs exhibited characteristic Tb^{3+} emissions at approximately 488, 544, 586, and 621 nm, with the dominant green emission at 544 nm assigned to the $^5D_4 \rightarrow {}^7F_5$ transition. The emission intensity increased with Tb^{3+} concentration up to 4%, suggesting that concentration quenching was not significant within the investigated range. CIE analysis showed green to yellowish-green emission with CCT values of 5314–5526 K, indicating relatively stable chromaticity. Time-resolved PL decay curves were well fitted by a bi-exponential model, and the average lifetime decreased from 4.13 to 2.60 ms with increasing Tb^{3+} concentration, reflecting enhanced Tb^{3+}–Tb^{3+} interactions and non-radiative energy transfer. These results demonstrate that MgF_2:Tb^{3+} NCs are promising green-emitting fluoride nanophosphors for UV/near-UV-excited photonic and optical applications.

PIII-24

TUNING THE OPTICAL PROPERTIES AND EXCITED-STATE DYNAMICS OF CARBON QUANTUM DOTS DOPED LANTHANUM

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Abstract. Doping carbon quantum dots (CQDs) with metal ions provides an effective strategy for modifying their electronic structure, surface states, and photoluminescence behavior. In this work, the influence of lanthanum (La) doping on the optical properties and excited-state dynamics of carbon quantum dots was systematically investigated using complementary spectroscopic techniques. UV–Vis absorption spectroscopy was employed to characterize the electronic absorption features of the undoped and La-doped CQDs, while photoluminescence (PL) spectroscopy was used to evaluate the changes in emission intensity, emission wavelength, and spectral bandwidth induced by La incorporation. Photoluminescence excitation (PLE) measurements were performed to identify the excitation pathways associated with the emissive states. In addition, time-resolved photoluminescence (TRPL) spectroscopy was employed to investigate the excited-state lifetime and carrier recombination dynamics. The spectroscopic results indicate that La doping modifies the electronic and surface-related states of CQDs, resulting in pronounced changes in their optical absorption and photoluminescence characteristics. The variation in PL intensity and excited-state lifetime is attributed to changes in surface passivation, defect-related states, and radiative/non-radiative recombination pathways induced by La incorporation. The correlation between steady-state and time-resolved spectroscopic measurements provides insight into the role of La-related states in controlling the optical response of CQDs. These findings demonstrate that lanthanum doping is a promising approach for tailoring the photophysical properties of carbon quantum dots for potential applications in optical sensing, light-emitting materials, photodetectors, and optoelectronic devices.

Keywords: Carbon quantum dots; lanthanum doping; photoluminescence; surface states; excited-state dynamics.

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PIII-25

EVALUATION OF GROWTH UNIFORMITY IN Tb^{3+}-DOPED $Lu_3Al_5O_{12}$ SINGLE CRYSTALS THROUGH LUMINESCENCE AND RADIOLUMINESCENCE MEASUREMENTS

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Abstract. Tb-doped $Lu_3Al_5O_{12}$ single crystal was grown by the micro-pulling-down method using a tungsten crucible, and their structural, optical and luminescence properties were systematically investigated. To evaluate the uniformity of the as-grown crystal, four samples collected from different positions along the growth direction were comparatively characterized. The UV–Vis absorption spectra exhibited similar spectral profiles for all samples, with characteristic absorption bands in the ultraviolet region. Photoluminescence spectra showed the characteristic Tb^{3+} emissions, dominated by the $^5D_4 \rightarrow {}^7F_5$ transition around 544 nm. Although slight variations in emission intensity were observed among the samples, the emission and excitation peak positions remained essentially unchanged. The luminescence decay curves showed nearly identical decay lifetimes of approximately 2.8 ms for all four samples. Radioluminescence measurements further revealed similar emission profiles, with only moderate variations in the integrated intensity among the samples. These results demonstrate good uniformity of the optical and luminescence properties of the Tb doped LuAG crystal along the growth direction and demonstrate the feasibility of the μ-PD method using a tungsten crucible for the growth of Tb single crystals with potential for scintillation applications.

Keywords: Tb-doped $Lu_3Al_5O_{12}$, single crystal, micro-pulling-down method, uniformity, scintillation.

PIII-26

DESIGN AND INVESTIGATION OF METASURFACE-INTEGRATED OPTICAL FIBERS

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Abstract. Metasurface-integrated optical fibers have attracted increasing interest as a promising platform for manipulating light–matter interactions and developing compact fiber-based photonic devices. In this work, we numerically investigate a metasurface structure integrated onto the cross-sectional surface of an optical fiber and designed to operate in the telecommunication wavelength range. The optical response of the proposed structure is systematically analyzed through electromagnetic simulations, with particular attention to its absorption characteristics. The simulation results demonstrate a pronounced absorption response near the wavelength of 1550 nm, which is one of the key operating wavelengths for optical communication systems. The electromagnetic field distributions are further investigated to clarify the physical mechanism responsible for the observed absorption resonance and the interaction between the incident optical field and the metasurface elements. These results demonstrate the feasibility of integrating metasurface structures directly with optical fibers for tailoring their optical response. The proposed configuration may provide a promising platform for compact fiber-compatible photonic devices, with potential applications in optical sensing, filtering, and telecommunications.

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PIII-27

ENHANCED CONTRAST AND SENSITIVE PLASMONIC METASURFACE-BASED DUAL-BAND SENSOR WITH TRUNCATED PYRAMID

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Abstract. This work presents a numerical study of enhanced contrast and sensitive plasmonic metasurfaces formed by periodic arrays of subwavelength truncated pyramids of stacked silver (Ag) and silica (SiO_2) nano squares placed on an Ag layer. Two simulation methods of boundary element method (BEM) and finite-difference time-domain (FDTD) are used to determine the optical characteristics of the designed structure. Looking at the field distribution at the resonances, the strong confinement of incident light localized inside the air- SiO_2 spacer-layer, which has extremely low reflection (close to 0%), corresponded to the absorption of up to 100% and a high quality-factor (*Q-factor*) of ~180. Operating in the near-infrared range the proposed plasmonic metasurfaces has low Ohmic loss, it can produce the *E*-field enhancements of~65 and ~400 times at wavelengths of ~1372.0 and ~1499.0 nm, respectively, and high directivity of ~1296.

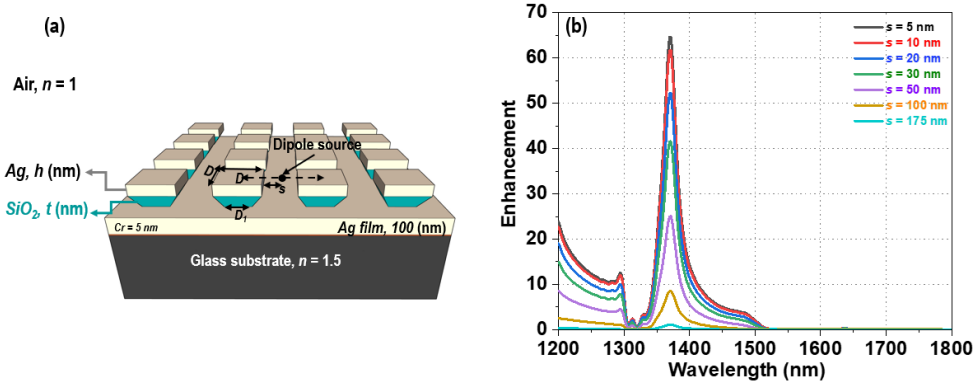

Fig.1. *(a) The designed plasmonic metasurfaces with truncated pyramid. (b) The proposed plasmonic metasurface for enhancement.*

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PIII-28

A METHOD FOR PREDICTING DIFFRACTION EFFICIENCY OF DIFFRACTIVE LENSES BASED ON TOOL NOSE RADIUS AND FEED RATE IN SPDT MACHINING

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Abstract. Machining parameter selection has a significant influence on the performance of diffractive lenses fabricated by single-point diamond turning (SPDT). This paper presents a theoretical method for predicting the diffraction efficiency of diffractive lenses as a function of tool nose radius and feed rate, two critical parameters in SPDT machining. The proposed method is developed based on scalar diffraction theory combined with a theoretical error model of the diffractive surface. Using this approach, the initial pre-machining values of these parameters can be determined to achieve a desired diffraction efficiency. This study provides an important theoretical foundation for the SPDT machining of diffractive lenses, offering practical significance in shortening process optimization time and improving both machining efficiency and surface quality.

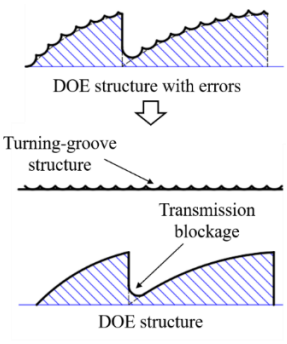

Fig.1. *Theoretical error model of the diffractive lenses fabricated by SPDT.*

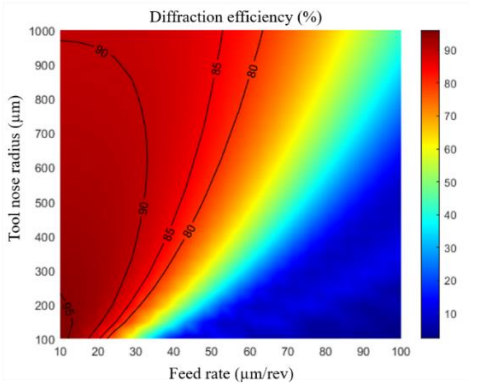

Fig.2. *Diffraction efficiency corresponding to different tool nose radii and feed rates.*

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PIII-29

INVESTIGATION OF THERMAL CONDUCTIVITY AND PHOTOTHERMAL PERFORMANCE OF CARBON NANOTUBE–COPPER NANOPARTICLE HYBRID NANOFLUIDS

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Abstract. In this study, carbon nanotube–copper nanoparticle (CNT–CuNP) hybrid materials were synthesized via a chemical reduction method and systematically characterized using Raman spectroscopy, X-ray diffraction (XRD), and Fourier-transform infrared spectroscopy (FTIR). The resulting CNT–CuNP hybrids were successfully dispersed in ethylene glycol (EG) and distilled water to produce stable nanofluids. Their thermal conductivity and photothermal conversion performance were subsequently evaluated. The thermal conductivity of both EG- and water-based nanofluids increased with temperature and CNT–CuNP concentration, reaching maximum enhancements of approximately 22% and 25%, respectively, at 55 °C for a CNT–CuNP concentration of 0.04 vol.%. Under simulated solar irradiation, the corresponding photothermal conversion efficiencies reached 32% for the EG-based nanofluid and 51% for the water-based nanofluid. Notably, the CNT–CuNP hybrid nanofluids exhibited superior photothermal performance compared with nanofluids containing CNTs or Cu nanoparticles alone. This enhanced performance is attributed to the synergistic effects of broadband CNT absorption and localized surface plasmonic absorption, together with improved heat transfer within the hybrid structure. These results demonstrate the potential of CNT–CuNP hybrid nanofluids as efficient heat-transfer and solar-absorbing media for solar thermal energy applications.

PIII-30

CONCENTRATION-DEPENDENT TERBIUM EFFECTS ON THE TERAHERTZ OPTICAL PROPERTIES OF Ce/Tb-DOPED LUAG CRYSTALS

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Abstract. Terbium-containing garnet crystals are promising candidates for magneto-optical devices and for the development of terahertz (THz) isolators because of the strong magneto-optical response associated with Tb^{3+} ions. In this study, $Lu_3Al_2Ga_3O_{12}:Ce_{0.5}Tb_x$ single crystals with different Tb concentrations were grown by the micro-pulling-down (μ-PD) method. Undoped LuAG and LuAG:Ce (1%) crystals were also investigated as reference samples. The THz optical properties of the crystals were characterized using a commercially available THz time-domain spectroscopy (THz-TDS) system in transmission geometry. The measured THz time-domain waveforms were compared to investigate the influence of Tb^{3+} concentration on the THz transmission response and pulse delay. The measurements indicated that the crystal composition and Tb^{3+} concentration influence their THz optical properties. The Lu-based garnet crystals exhibited refractive indices increasing from approximately 2 at 0.2 THz to around 3 at 1 THz. The $Lu_3Al_2Ga_3O_{12}:Ce_{0.5}Tb_x$ crystals showed similar dispersion behavior, with a moderate dependence on Tb concentration. Their dispersion characteristics were reasonably well described by the Sellmeier model, with R^2 values generally above 0.96. These results provide a basis for evaluating Tb-containing garnets as candidate materials for THz magneto-optical components. Future work will focus on measuring the Verdet constant through Faraday rotation in both the visible and THz regions and investigating its dependence on Tb^{3+} concentration.

***Keywords**:* Terbium concentration; Garnet crystal; THz-TDS; Faraday rotation.

PIII-31

COMPUTATIONAL DESIGN OF 2D METAL-SEMICONDUCTOR VAN DER WAALS HETEROSTRUCTURES FOR NEXT-GENERATION OPTOELECTRONIC DEVICES

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Abstract. The search for and exploration of metal-semiconductor contacts with Ohmic contact or tunable Schottky barriers poses both challenges and research interest. Recently, scientists have fabricated the thinnest gold sheet in the world, only one atom thick (Goldene), which promises significant applications in the field of electronics and semiconductors [Nature Synthesis 3, 744 751 (2024)]. Motivated by this breakthrough, we employ first-principles calculations to construct and investigate the structures, electronic properties, and contact behavior of goldene-based metal-semiconductor heterostructures integrated into solid-state device architectures. Moreover, we explore the tunability of Schottky barriers under external electric fields and interlayer coupling effects, further broadening the application potential of such heterostructures. Our findings suggest that goldene-based metal–semiconductor heterostructures can be seamlessly incorporated into next-generation devices, offering a promising alternative to traditional silicon-based technologies.

PIII-32

PLASMA-ENGINEERED AUNP/DWCNT/PEDOT HYBRID COMPOSITES: FABRICATION, STRUCTURAL, AND OPTICAL CHARACTERIZATION

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Abstract. A hybrid nanocomposite based on Au nanoparticle (AuNP)-decorated carboxyl functionalized double-walled carbon nanotubes (DWCNTs) and PEDOT is synthesized for photodetection applications. AuNPs are directly immobilized onto DWCNTs-COOH using a cold-plasma-assisted process, followed by incorporation into a PEDOT matrix. Structural and optical characterizations confirmed the successful formation of the hybrid nanocomposite and the uniform distribution of AuNPs on the DWCNT surface. The introduction of AuNPs enhanced the interfacial interaction between the conductive nanofillers and polymer matrix, leading to improved charge transport and light-matter interaction. The resulting composite films exhibited enhanced electrical conductivity and photoresponse compared with pristine DWCNT/PEDOT systems. This plasma-assisted strategy provides a simple and scalable route for engineering metal nanoparticle–carbon nanotube–polymer composites for future optoelectronic and photodetection devices.

Keywords: AuNPs; DWCNT; PEDOT; cold-plasma; photodetector.

Acknowledgement: This work is financially supported by Vietnam National Foundation for Science and Technology Development (NAFOSTED) under the grant number No. 103.02 2025.150.

PIII-33

SYNTHESIS AND PHOTOLUMINESCENCE PROPERTIES OF CARBON NANODOTS FROM DIFFERENT CARBON PRECURSORS

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Abstract. Carbon nanodots (CNDs) are a class of fluorescent carbon-based nanomaterials that have attracted considerable research interest due to their small size, distinctive optical properties, good dispersibility in aqueous media, and potential applications in various fields, particularly biomedicine. In this study, CNDs were synthesized via a hydrothermal method using three carbon precursors: citric acid monohydrate, glucose, and sucrose. Their morphology and particle size, structural characteristics, surface functional groups, and photoluminescence properties were investigated by TEM, XRD, FTIR, and photoluminescence spectroscopy, respectively. Preliminary results confirm the formation of nanoscale CNDs exhibiting photoluminescence under ultraviolet excitation. The different carbon precursors resulted in variations in particle size and photoluminescence characteristics. These findings provide a basis for optimizing CNDs synthesis and tailoring their optical properties toward potential applications in fluorescent labeling, bioimaging, and biosensing.

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PIII-34

INVESTIGATION OF THE OXIDASE-LIKE ACTIVITY OF PLATINUM NANOPARTICLES USING TMB AS A CHROMOGENIC SUBSTRATE

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Abstract. Platinum nanoparticles (Pt NPs) have attracted considerable attention as promising nanozyme materials owing to their high catalytic activity, chemical stability, and enzyme-mimicking properties. In particular, their oxidase-like activity enables the catalytic oxidation of chromogenic substrates using molecular oxygen as an oxidant, offering a simple catalytic platform without the requirement for additional hydrogen peroxide. In this study, Pt NPs were synthesized and their oxidase-like catalytic activity was investigated using 3,3′,5,5′-tetramethylbenzidine (TMB) as a model substrate. The as-prepared Pt NPs exhibited an average particle size of approximately 5 nm and showed efficient oxidase-like catalytic activity. Notably, the Pt NPs exhibited high catalytic activity toward TMB oxidation in buffer solution at pH 5.0, resulting in the rapid formation of the blue oxidized TMB (oxTMB) product with a characteristic absorption peak at 652 nm. These findings demonstrate that the synthesized Pt NPs can serve as efficient oxidase-mimicking nanozymes and highlight their potential for applications in colorimetric sensing, analytical detection, and nanozyme-based catalytic systems.

PIII-35

NANOCRYSTALLINE GRAPHITIC CARBON-COATED Cu NANOWIRES PREPARED BY LOW TEMPERATURE CHEMICAL VAPOR DEPOSITION AS A LOW COST, HIGHLY EFFICIENT SURFACE ENHANCED RAMAN SCATTERING PLATFORM

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Abstract. A facile process was developed for fabrication of Cu nanowires. First, the growth of densed CuO nanowires was achieved by thermal oxidation method. The oxides nanowires were then reduced to Cu using H_2 as reactive ambient. The nanocrystalline graphitic carbon were coated on Cu nanowires by chemical vapor deposition at low temperature to maintain the 1D morphology of the nanoproducts. HRTEM, Raman spectroscopy, and XPS confirmed the copper nanowires/ nanocrystalline graphitic carbon (NGC) core/shell nanostructures. The investigation shows that the prepared nanoproduct are robust and sensitive surface enhanced Raman scattering platform, demonstrated by a low limit of detection of methylence blue of 1.15 10^{-10} M and a long term of stability of more than 90 days. Cu/NGC nanowires offer a highly stable and economical SERS platform for sensitive trace chemical analysis.

Keywords: copper nanowires; chemical vapor deposition; nanocrystalline graphitic carbon; surface-enhanced Raman scattering.

PIII-36

OPTICAL PROPERTIES AND GROWTH KINETICS OF HIGHLY UNIFORM 40 NM GOLD NANOPARTICLES SYNTESIZED BY GLUCOSE MEDIATED SEEDED GROWTH

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Abstract. Gold nanoparticles (AuNPs) exhibit size-dependent localized surface plasmon resonance (LSPR) properties, making them attractive materials for optical sensing and photonic applications. In this work, we investigated the growth kinetics and optical properties of highly uniform AuNPs with a target diameter of approximately 40 nm synthesized by a surfactant-free, glucose-mediated seeded growth method at room temperature. Small gold seeds with an average diameter of approximately 14 nm were first prepared and subsequently used to initiate the growth of larger nanoparticles in an aqueous gold precursor solution containing glucose. The growth process was monitored by UV–Vis spectroscopy at different reaction times to correlate the evolution of the surface plasmon resonance with nanoparticle formation. The results showed a gradual red-shift and increase in the LSPR absorption band during the growth process, accompanied by a progressive increase in optical density. The reaction approached completion after approximately 90–100 min. The resulting AuNPs exhibited a well-defined LSPR band at approximately 523–525 nm and an average diameter of approximately 40 nm, with relatively narrow size distribution. The high optical density and well-defined plasmonic response demonstrate the effectiveness of the seeded growth approach in producing AuNPs with reproducible optical properties. The observed correlation between growth kinetics, nanoparticle size, and LSPR characteristics provides useful insight into the controlled synthesis of plasmonic nanomaterials for optical sensing and spectroscopy-based applications.

Keywords: gold nanoparticles; localized surface plasmon resonance; UV–Vis spectroscopy; seeded growth; growth kinetics; plasmonic nanomaterials.

PIII-37

THEORETICAL MODELING AND NUMERICAL SIMULATION OF THERMAL DRIFT IN CO-PACKAGED OPTICS (CPO) OPTOELECTRONIC PACKAGING

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Abstract. The demand for ultra-high bandwidth and low-latency interconnects in high-performance computing has driven the adoption of Co-Packaged Optics (CPO) and optoelectronic integration. However, severe thermal dissipation from high-power electronic integrated circuits (ICs) introduces thermal drift, causing refractive index shifts and optical power degradation in adjacent photonic components. This paper presents a theoretical modeling framework and 3D multiphysics numerical simulation of a low-cost, lab-scale optoelectronic package testbed. Built on a multi-layer composite substrate acting as an interposer, the system integrates a semiconductor light source, optical power detection modules, and localized heat generators to emulate real-world thermal interference. Finite element method (FEM) thermal simulations were conducted to map localized heat gradients and identify critical thermal coupling zones. Numerical results closely validated the analytical model, providing a quantitative assessment of optical power loss and wavelength drift as a function of package temperature. Furthermore, passive thermal management techniques using copper thermal via arrays were implemented, successfully mitigating thermal drift effects by 60.2%. The proposed prototype offers an accessible, cost-effective framework for characterization and thermal optimization in optoelectronic packaging and semiconductor testing education.

Keywords—Optoelectronic packaging, Co-Packaged Optics (CPO), thermal drift, thermal management, optical interconnects, Silicon Photonics.

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PIII-38

STRUCTURAL PARAMETER OPTIMIZATION OF AS_2S_5 CHALCOGENIDE SUSPENDED-CORE FIBERS FOR MID-INFRARED SUPERCONTINUUM GENERATION

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Abstract. This paper presents a theoretical and numerical simulation study on the effects of geometric structural parameters - including core radius (r_{core}), strut thickness (t_{strut}), and air-hole radius (r_{hole}) - on group velocity dispersion (GVD) characteristics and supercontinuum generation (SCG) in As_2S_5 chalcogenide glass photonic crystal fibers (PCF). Thereby, investigating variations in material structure allows for tailored dispersion profiles optimal for supercontinuum generation in suspended-core fibers. The structural parameters are varied within the following ranges: core radius (r_{core}) from $1\ \mu$m to $5.0\ \mu$m, strut thickness (t_{strut}), and air-hole radius (r_{hole}) from $20\ \mu$m to $40\ \mu$m. By investigating the dispersion profiles through structural variations, our team identified the most suitable dispersion curve to achieve supercontinuum generation via the suspended-core fiber. Simulation results confirm that the optimized As_2S_5 PCF structure enables the generation of a flat, high-brightness, and continuous SCG spectrum spanning from the near-infrared to the mid-infrared region ($0.7\ \mu\text{m} - 5.0\ \mu\text{m}$). We determined the ideal conditions through structural parameter investigation, thereby achieving the broadest spectral width. Using 50 fs laser pulses with a peak power of 100 kW, the primary mechanisms driving supercontinuum generation in the ChG glass matrix involve self-phase modulation, stimulated Raman scattering, four-wave mixing, and soliton fission. This setup yields a broadband mid-infrared supercontinuum source featuring high peak power, low pulse energy (1 nJ), and an ultra-broad spectral bandwidth ranging from 1500 nm to 4500 nm (from the near-infrared to the mid-infrared region).

PIII-39

COMPOSITION-DEPENDENT PHOTOCATALYTIC ACTIVITY AND MAGNETIC RECOVERY OF g-C_3N_4/Fe_3O_4 NANOCOMPOSITES

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Abstract. Graphitic carbon nitride (g-C_3N_4) is a visible-light-responsive photocatalyst whose practical use is limited by charge-carrier recombination and difficult powder recovery. In this work, a series of g-C_3N_4/Fe_3O_4 nanocomposites with nominal mass ratios of 9/1, 8/2, 7/3, and 6/4 were prepared by precipitating Fe_3O_4 directly in a suspension of thermally synthesized g-C_3N_4. X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), UV-Vis diffuse reflectance spectroscopy, photoluminescence (PL), and vibrating sample magnetometry (VSM) were used to correlate composition with structure, optical response, magnetic behavior, photocatalytic activity, and catalyst recovery. The Fe_3O_4 crystallite sizes in the directly precipitated composites were approximately 12.7-15.3 nm, smaller than the ~21 nm crystallites of separately prepared Fe_3O_4. Fe_3O_4 incorporation broadened visible-light absorption and quenched PL, while saturation magnetization increased from 2.8 emu g^{-1} for the 9/1 sample to 13.3 emu g^{-1} for the 6/4 sample. The 9/1 composite showed the highest Rhodamine B decolorization rate under Xe-lamp irradiation, with an apparent pseudo-first-order rate constant of 0.017 min^{-1}, compared with 0.012 min^{-1} for pristine g-C_3N_4 and 0.011 min^{-1} for the mechanically mixed 9/1 control. First-cycle recovered catalyst mass increased from 84.5% for 9/1 to approximately 95% for Fe_3O_4-richer compositions. During three reuse cycles, the 9/1 sample retained photocatalytic activity, although recovered mass decreased from 84.5% to 52.0%. These results reveal a non-monotonic composition dependence and demonstrate that photocatalytic kinetics and magnetic recovery must be optimized simultaneously.

Keywords: g-C_3N_4, Fe_3O_4, nanocomposite, photocatalysis, magnetic recovery.

PIII-40

STUDY ON NON-DESTRUCTIVE EVALUATION METHODS FOR YAG CRYSTALS

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Abstract. While Czochralski method is widely used for growing optical crystals, internal defects formation remains a challenge in crystal growth. Conventional evaluation requires cutting the crystal, which diminishes its commercial value and is therefore unsuitable for evaluating large-aperture bulk crystals. We developed a non-destructive method for visualizing internal defects using crossed-polarizer observation combined with refractive index matching [1]. A non-doped YAG crystal was immersed in silicone oil (n = 1.505) and observed while being rotated through 360°, as shown in the Figure. The results showed that internal brightness variations were more clearly observed in silicone oil than in air. This is attributed to the reduced refractive-index mismatch between YAG (n ≈ 1.83 [2]) and the surrounding medium, which suppresses surface refraction and reflection and enhances the visibility of defect-induced optical anisotropy. These results demonstrate the feasibility of non-destructive observation of internal features in bulk YAG crystals using crossed-polarizer imaging.

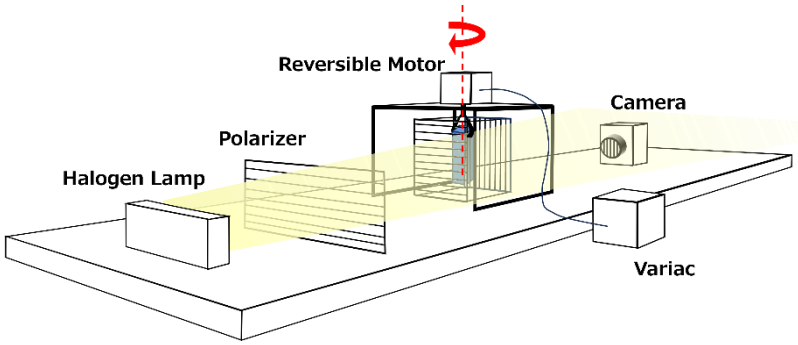

Fig.1. *Schematic of the experimental setup for crossed-polarizer observation.*

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PIII-41

ENHANCEMENT OF PIEZOELECTRIC PERFORMANCE BY RELIEVING SUBSTRATE CLAMPING THROUGH FEMTOSECOND-LASER MICROMACHINING

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Abstract. Piezoelectric actuators convert voltage into mechanical motion. In the longitudinal d33 mode, the electric field and displacement are directed through the film thickness. A rigid substrate restricts lateral deformation and suppresses the effective response, while releasing the active layer can enhance it [1]. We therefore used femtosecond laser micromachining to reduce substrate clamping without forming a free-standing membrane.

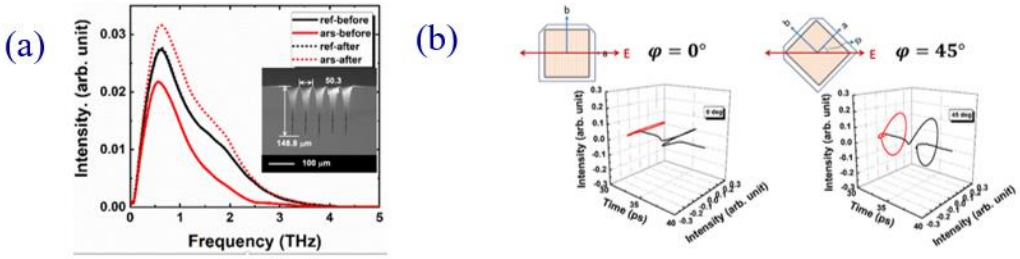

Fig.1. *(a) The 3D and (b) cross-sectional image of microstructures, observed by CLSM (Left) Fig.2 The piezoelectric constant under 50~100 V (Right).*

A 12.7-μm-thick, (001)-oriented Pb (Zr, Ti) O_3 film was deposited by chemical solution deposition and patterned using 1045-nm, 700-fs laser pulses at 100 kHz. After annealing at 700 °C for 5 min, the 3D CLSM image in Fig. 1(a) shows periodic line patterns formed on the film. The cross-sectional profile in Fig. 1(b) shows V-shaped grooves with top widths of 15.8–30.7 μm and depths of 9.61–11.8 μm. The average depth-etching rate was approximately 34 μm/min.

Figure 1a shows d_{33}, eff measured by laser Doppler vibrometry. At 71.2 kV/cm, d_{33}, eff increased from approximately 105 pm/V for the widest pattern to 240 pm/V for the narrowest pattern. This result indicates that narrower patterns reduce substrate clamping and enhance the longitudinal response of piezoelectric MEMS.

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PIII-42

SYNTHESIS AND PURIFICATION OF HIGHLY LUMINESCENT $CsPbBr_3$ PEROVSKITE NANOCRYSTALS WITH HIGH PHOTOLUMINESCENCE QUANTUM YIELD

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Abstract. $CsPbBr_3$ perovskite nanocrystals (NCs) have emerged as promising luminescent materials for light-emitting applications owing to their high photoluminescence quantum yields (PLQYs), narrow emission bandwidths, and tunable optical properties.[1-3] In this work, green-emitting $CsPbBr_3$ NCs were synthesized via a hot-injection method, followed by systematic investigation of solvent-assisted purification conditions to optimize their photophysical properties. Different purification approaches were employed to effectively remove residual precursors and reaction by-products while minimizing damage to the nanocrystal surface. The resulting $CsPbBr_3$ NCs exhibited a sharp green photoluminescence emission centered at 515 nm, characteristic of high-quality $CsPbBr_3$ nanocrystals. Importantly, optimized purification resulted in a solution PLQY exceeding 90%, demonstrating highly efficient radiative recombination and excellent luminescence performance. Time-resolved photoluminescence measurements further revealed nanosecond-scale carrier lifetimes, suggesting suppressed non-radiative recombination in the optimized samples. The combination of high PLQY, intense green emission, and favorable photophysical properties highlights the potential of these $CsPbBr_3$ NCs as efficient emissive materials for solution-processable light-emitting diodes (LEDs). This study demonstrates that controlling post-synthetic purification is an effective strategy for improving the optical quality of $CsPbBr_3$ NCs and provides practical insights into the development of highly emissive perovskite nanocrystals for next-generation LED applications.

Keywords: CsPbBr3 nanocrystals; purification; photoluminescence quantum yield; TRPL; perovskite semiconductors.

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PIII-43

ACHIEVING HIGH PLQY IN $CsPbI_3$ PEROVSKITE QUANTUM DOTS THIN FILMS VIA A DUAL STRATEGY

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Abstract. Cesium lead iodide $CsPbI_3$ all-inorganic perovskite quantum dots (QDs) possess remarkable defect tolerance and near-unity photoluminescence quantum yield (PLQY) in solution, positioning them as prime candidates for next-generation light-emitting diodes (LEDs) and display technologies. However, due to the inherently soft ionic lattice lattice and low formation energy of $CsPbI_3$, surface-capping ligands readily detach during essential post-synthesis purification with antisolvent. This severe ligand loss induces uncoordinated surface traps and non-radiative recombination centers, which severely degrades both the PLQY and phase stability of solid-state thin films. Here, we report an integrated strategy combining antisolvent purification tuning with cation doping to yield high quality perovskite quantum dots. By optimizing the volumetric ratio of antisolvent-to-crude solution and refining the washing cycle frequency, surface ligand stripping was minimized while unreacted precursors and synthesis residues were efficiently eliminated. Furthermore, incorporating smaller cations to partially replace lead Pb^{2+} stabilized the perovskite crystal structure for approximately 10 weeks. Consequently, this synergistic approach yields exceptionally high PLQY values, achieving nearly 100% in solution and ~80% in solid-state thin films, demonstrating highly effective trap passivation. These results show that defect traps can be minimized through a straightforward combination of purification and composition engineering, offering a practical path toward efficient LED applications.

Keywords: $CsPbI_3$ perovskite quantum dots, light-emitting diodes, PLQY, photoluminescence lifetime, antisolvent purification.

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OPTIC EXPRESSION: A MÖIRÉ-INTERFEROMETRIC FRAMEWORK FOR A CONCENTRATION-DEPENDENT OPTICAL ORDER PARAMETER PHASE-RECONSTRUCTED VIDEO ANALYSIS OF SUCROSE CONCENTRATION–DEPENDENT OPTICAL MORPHOLOGY

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Abstract. We report an exploratory video-wide optical study of aqueous sucrose concentration using a rotating polarization element and a Moiré/interferometric imaging geometry. Seven concentrations (0, 3, 6, 9, 12, 15, and 18 g/100 mL) were recorded under a common imaging protocol. Automated morphology analysis of 30 frames per condition identified a non-monotonic transition, with 9 g/100 mL showing the largest branching complexity across branch-point count, connected-component count, and skeleton length, followed by progressive simplification and near-collapse at 18 g/100 mL. A complementary temporal analysis identified a recurring fundamental timescale near 0.447 Hz and harmonic components near 0.895, 1.34, and 1.78 Hz. Phase reconstruction relative to the fundamental produced concentration-dependent I(φ) waveforms. Importantly, the amplitude of temporal intensity modulation did not simply track morphological complexity: 9 g/100 mL was not the maximum in absolute temporal modulation. This dissociation motivates a polarization-state/phase interpretation rather than a simple brightness model. We therefore propose a testable framework in which concentration modifies polarization-state dynamics and the resulting interference/Moiré morphology. A Poincaré-sphere description is presented as a conceptual framework; a full Stokes measurement, especially S3, is still required before any Pancharatnam–Berry or geometric-phase claim can be made. Preprint status. Exploratory analysis of the currently available video data. The Poincaré-sphere interpretation is a hypothesis-generating framework, not a demonstrated geometric-phase measurement. Absolute motor-angle calibration, full Stokes polarimetry, refractive-index controls, and independent replication remain to be completed.

Keywords: Moiré interference; polarization optics; Poincaré sphere; Stokes parameters; optical morphology; sucrose concentration; branching complexity; geometric phase; video analysis.

PIII-45

DEEP LEARNING-BASED INTRUSION DETECTION FOR OPTICAL COMMUNICATION NETWORKS USING HYBRID CNN-LSTM ARCHITECTURE

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Abstract. The increasing adoption of optical communication networks in smart infrastructures, industrial control environments, and next-generation Internet architectures has introduced new challenges in network security. As network traffic becomes more heterogeneous and dynamic, conventional intrusion detection systems often struggle to identify complex attack patterns, particularly when dealing with high-dimensional data and temporal dependencies among traffic flows. To address these limitations, a hybrid deep learning framework based on Convolutional Neural Networks (CNN) and Long Short-Term Memory (LSTM) networks is investigated for network intrusion detection. In the proposed architecture, CNN layers are employed to automatically extract discriminative spatial features from traffic records, while LSTM layers capture sequential and temporal relationships that are difficult to model using traditional machine learning approaches. To validate the proposed framework, experiments were conducted using the UNSW-NB15 benchmark dataset, which contains a diverse range of contemporary network attack patterns and legitimate traffic records. The dataset serves as a preliminary evaluation platform for assessing the model's intrusion detection capability prior to its application in optical communication infrastructures. The performance of the model was evaluated on the UNSW-NB15 benchmark dataset containing 175,341 network traffic instances described by 42 selected features. Experimental evaluation yielded an accuracy of 98.42%, a precision of 97.91%, a recall of 98.03%, and an F1-score of 97.97%. Comparative analysis further indicates that the CNN-LSTM model consistently achieves better detection performance than several widely used baseline methods, including Random Forest, Support Vector Machine (SVM), and a standalone CNN architecture. These findings suggest that integrating spatial feature learning with temporal sequence modeling provides a robust and effective solution for enhancing intrusion detection capabilities in intelligent optical communication networks.

Keywords: Optical communication network, Intrusion Detection System, CNN-LSTM, Deep Learning, Cybersecurity, Artificial Intelligence.

PIII-46

AN EFFICIENT ITERATIVE TRIMEAN FILTERING STRATEGY FOR BORN-BASED OPTICAL TOMOGRAPHY

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Abstract. Optical tomography has emerged as a promising imaging technique for biomedical diagnostics owing to its ability to non-invasively reconstruct the internal optical properties of biological tissues. Nevertheless, the Born iterative method (BIM), one of the most widely used reconstruction algorithms, is highly susceptible to measurement noise, leading to degraded image quality and slow convergence. To overcome this limitation, this paper proposes an iterative Trimean-filtered Born iterative method (Trimean-filtered BIM) for robust optical image reconstruction. The Trimean filter, which combines the median with the first and third quartiles, is incorporated into each BIM iteration to effectively suppress random noise while preserving important structural and edge information. The proposed method is validated through numerical simulations under different settings and compared with conventional BIM. Quantitative and qualitative results demonstrate that the proposed Trimean-filtered BIM consistently achieves lower reconstruction errors, improved convergence behavior, and enhanced image quality. In particular, the Trimean filter provides a better balance between noise suppression and detail preservation than the conventional median filter, resulting in clearer object boundaries and more accurate optical contrast reconstruction. The proposed framework offers a simple yet effective enhancement to the conventional BIM without increasing computational complexity significantly. These results suggest that the Trimean-filtered BIM is a promising approach for improving the robustness and accuracy of optical inverse scattering reconstruction in noisy environments, with potential applications in biomedical optical imaging.

***Keywords**:* Optical tomography, Born iterative method, Trimean filtering, image reconstruction, noise reduction.

PIII-47

AN AUTOMATED COMPUTATIONAL WORKFLOW FOR PASSIVE ATHERMALIZATION OF OPTICAL SYSTEMS

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Abstract. Passive athermalization is widely adopted in optical systems operating under varying environmental temperatures to mitigate performance degradation caused by thermo-optical and thermo-mechanical effects. However, conventional passive athermalization workflows typically require repeated optical analysis at different temperatures, and extensive interactions between optical and mechanical engineering disciplines. This paper presents an automated computational workflow for passive athermalization of optical systems developed using Zemax OpticStudio and Python-based automation through the ZOS-API interface. The proposed framework integrates optical-thermal performance evaluation, optimization, material assessment and automated reporting into a unified execution process. Unlike conventional approaches that require multiple manual iterations across engineering disciplines, the proposed workflow enables a complete passive athermalization assessment from a single optical model input. A representative imaging lens is used to demonstrate the workflow. Results show significant reduction in thermal focus drift while considerably reducing engineering effort and design iteration overhead. The presented approach offers a practical tool for accelerating the development of thermally stable optical systems.

Keywords: Passive Athermalization, Optical Design Automation, Thermal Analysis, Zemax OpticStudio, ZOS-API, Imaging Systems.

PIII-48

NUMERICAL ANALYSIS OF EFFECTIVE MODE AREA AND CONFINEMENT LOSS IN $C_2H_4Br_2$-FILLED As_2S_3 SUSPENDED-CORE PHOTONIC CRYSTAL FIBER

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Abstract. We numerically investigate the effective mode area (A_{eff}) and confinement loss (L_c) characteristics of suspended-core photonic crystal fibers (SCFs) based on As_2S_3 chalcogenide glass with air holes infiltrated by 1,2-dibromoethane ($C_2H_4Br_2$). The proposed structure consists of a three-bridge suspended core design with the slot-width-to-core-radius ratio w/r_c varied from 0.45 to 0.95. We analyze the wavelength-dependent behavior of effective mode area and confinement loss over the 2.0-5.0 μm range. The results indicate that A_{eff} and L_c depend significantly on the w/r_c ratio. Furthermore, the proposed SCF structure significantly enhances mode confinement, achieving a confinement loss (L_c) of less than 10^{-3} at wavelengths below 4.5 μm. The effective mode area is small, ranging from 1.35 μm² to 1.65 μm² at a wavelength of 2.5 μm. The infiltration of $C_2H_4Br_2$ modifies the refractive-index distribution and enhances optical confinement, combined with the high nonlinearity of the As_2S_3 material, this makes the fiber promising for nonlinear optical applications.

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PIII-49

ENHANCED MID-INFRARED REFRACTIVE-INDEX SENSING IN TOLUENE-INFILTRATED $As_{38.8}Se_{61.2}$ SUSPENDED-CORE PHOTONIC CRYSTAL FIBER

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Abstract. We show numerically that a toluene-infiltrated $As_{38.8}Se_{61.2}$ suspended-core photonic crystal fiber operates as a mid-infrared refractive-index sensor whose sensitivity is enhanced by mode delocalization. In the sub-wavelength core (D_c = 1.1 μm), the fundamental mode expands out of the core as the wavelength increases; its effective area reaches roughly four to six times the core area at 6 μm, so that the fraction of guided power inside the infiltrated holes rises from about 1% near 1.6 μm to 22% near 4.3 μm. Full-vector finite-element modeling from 1 to 6 μm and over eleven strut widths shows that the air-referenced index contrast climbs from 0.025 at 2 μm to 0.52 at 6 μm, while the local working-point sensitivity relevant to concentration measurement (obtained from the in-hole power fraction) is about half as large because the effective index varies non-linearly with the fill index. The strut width provides a second, opposing control, and the response is almost polarization-independent (below 2%). The confinement loss, taken from the imaginary part of n_{eff}, stays below 0.2 dB/m across the band (far under 1 dB over a 1 cm length), so the usable band is set by material and liquid absorption; a 1 cm interferometric read-out then gives a detection limit of a few $\times 10^{-5}$ RIU, subject to temperature compensation. These results position the fiber as a metal-free mid-infrared platform for organic-solution refractometry.

Keywords: suspended-core photonic crystal fiber; chalcogenide glass; refractive-index sensor; mode delocalization; mid-infrared; optofluidic sensing.

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PIII-50

OPTICAL BANDGAP MODULATION AND ELECTROCHEMICAL KINETICS IN MIXED-PHASE V_2O_5 NANOWIRES

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Abstract. Mixed-phase vanadium pentoxide nanowires provide a useful platform for investigating how secondary phases influence electronic structure, optical transitions, and electrochemical transport. In this work, V_2O_5 nanowires with different phase compositions were synthesized hydrothermally at 200 and 250 °C. Quantitative X-ray diffraction analysis showed that increasing the synthesis temperature raised the α-V_2O_5 fraction from 69% to 90%, while reducing the combined β-V_2O_5 and V_6O_{13} secondary-phase content from 31% to approximately 10%. This phase evolution narrowed the direct optical bandgap from 2.71 to 2.54 eV and the indirect bandgap from 2.12 to 1.74 eV, accompanied by an increased contribution from defect-related photoluminescence. X-ray photoelectron spectroscopy revealed that the V^{4+} population decreased by only a factor of 1.2 despite a 3.1-fold reduction in secondary-phase content. This finding indicates that V^{4+} and oxygen-vacancy-related centers are redistributed into the α-V_2O_5 lattice rather than eliminated, consistent with vanadyl pdπ-bond disruption and electron injection into V 3d states. Electrochemical impedance spectroscopy further showed that the total interfacial resistance decreased from 349.3 to 84.7 Ω, whereas the Na^+ diffusion coefficient decreased from 8.58×10^{-14} to 5.66×10^{-14} $cm^2\ s^{-1}$. These results demonstrate that secondary-phase suppression and defect redistribution simultaneously modulate the optical band structure and create a trade-off between enhanced interfacial charge transfer and restricted ion diffusion in V_2O_5 nanowires.

PIII-51

STUDYING THE PHOTO-, THERMO-LUMINESCENCE PROPERTIES OF TeO_2-B_2O_3-Na_2O-K_2O-Ce_2O_3 GLASSES

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Abstract. Telluroborate glasses with compositions of (45-x)B_2O_3.35TeO_2.10Na_2O.10K_2O.$x$$Ce_2O_3$ (x = 0.25, 0.5, 1.0, and 1.5) were fabricated by the melt-quenching method at 980 °C. The spectroscopic properties of the prepared samples were investigated through excitation and photoluminescence spectra. The emission spectra exhibit a broad emission band characteristic of Ce^{3+} in the 380 - 500 nm range. The optimum Ce^{3+} concentration for emission was found to be approximately 1%. The thermoluminescence (TL) properties were investigated through integrated glow curves and TL spectra under β-ray irradiation. The TL glow curves of the samples exhibit four TL peaks associated with network defects acting as electron traps. The TL intensity is significantly enhanced by the presence of Ce ions in the glass network. Kinetic parameters, including the activation energy and frequency factor, were determined by curve fitting based on general-order kinetics using TLAnal software. In the telluroborate glasses doped with Ce^{3+}, Ce^{3+} ions serve as both recombination and luminescence centers. Dosimetric characteristics, including dose response and repeatability, were systematically investigated. The obtained results suggest that Ce^{3+}-doped telluroborate glasses have potential applications in lighting and radiation safety.

***Keywords**:* Thermoluminescence, Telluroborate glass, Dosimetric characteristic.

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PREPARATION AND INVESTIGATION OF NITROGEN-DOPED GRAPHENE QUANTUM DOTS FOR POTENTIAL APPLICATION IN PHOTOACTIVITY

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Abstract. Graphene quantum dots (GQDs) are promising nanomaterials for various applications because of their unique optical, tunable photoluminescence and biocompatibility. Graphene quantum dots can be prepared with doping form are researched combining with various materials to improve rapidly transforming the energy fields, photocatalyst and biomedical applications. We used nitrogen-doped graphene quantum dots (N-GQDs) with tunable optical properties for fabricating of nanocomposite films as N-GQD:TiO_2. The analysis methods as UV-VIS, photoluminescence, Raman, HR-TEM, SEM and XRD were conducted for this research purpose with explanations. This work presents some important aspects of N-GQD:TiO_2 nanocomposites as photocatalyst applications. These include: synthesis methods of nanocomposites with structural formulations and various characterization techniques which can be used to judge the photocatalytic performance for the application in solar energy conversion and although some new challenges. This report also discusses the future opportunities for GQDs, emphasizing potential in advancing modern photocatalyst, solar energy and drive healthcare solutions. With biocompatible property, GQD also contribute to the expanding field of research in biomedical applications.

Keywords: Nitrogen-doped graphene quantum dots, photoactivity, photocatalyst, bioimaging.