HỘI NGHỊ QUANG HỌC QUANG PHỔ TOÀN QUỐC LẦN THỨ VIII

THE 8th INTERNATIONAL CONFERENCE ON PHOTONICS AND APPLICATIONS

Danang, Vietnam. 12-16 August 2014

ABSTRACT & PROGRAM

http://iop.vast.ac.vn/activities/HNQHQP_ICPA/08/

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Vietnam National University Hanoi

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Vietnam Society of Optics & Spectroscopy

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Optics, Photonics and Spectroscopy

Photonic Materials and Devices

Optoelectronics and Integrated Optics

Advanced Laser Light Sources

Nonlinear Optics

Spectroscopy of Nano and Photonic Materials

Applications of Optics, Photonics and Spectroscopy

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BRIEF PROGRAM

(Conference location: *03 Quang Trung Street, Da Nang City)*

Date / Time	Tuesday 12/08/2014	Wednesday 13/08/2014	Thursday 14/08/2014	Friday 15/08/2014	Saterday 16/08/2014
08:30 ÷ 12:30	**Registration** *(at Duy Tan University, 03 Quang Trung Street, Da Nang)*	- **Registration** - **Official Opening** *(Conf. Hall 713)* - **PLENARY SESSION**	- **SESSION A** - **SESSION B** - **SESSION C**	- **SESSION A** - **SESSION B** - **SESSION C** - **POSTER II**	**Social Programme**
		Buffet Lunch	**Buffet Lunch**	**Buffet Lunch**	
13:30 ÷ 17:30	**Registration** *(at Duy Tan University, 03 Quang Trung Street, Da Nang)*	- **SESSION A** *(Conf. Room 702)* - **SESSION B** *(Conf. Room 407)* - **SESSION C** *(Conf. Room 410)*	- **SESSION A** - **SESSION B** - **SESSION C** - **POSTER I**	- **SESSION A** - **SESSION B** - **SESSION C** - **PLENARY SESSION** *(Conf. Hall 713)* **Official closing**	**Social Programme**
18:30 ÷ 20:20		**Conference Party**		**Conference Party**	

Note:
- **SESSION A: PHOTONICS AND APPLICATIONS** *(Conf. Room 702)*
- **SESSION B: QUANTUM PHOTONICS AND NANOPHYSICS** *(Conf. Room 407)*
- **SESSION C: OPTICS, LASERS AND APPLICATIONS** *(Conf. Room 410)*

PROGRAM

August 13, 2014 (Tuesday)

08: 00 - 08: 30 **Registration**

Welcoming music performance of DuyTan University

08: 30 - 09: 30 **Official Opening** (Prof. N. Dai Hung & Prof. Dao Van Lap)

- Welcoming speech of the Governor of Da Nang City
- Welcoming speech of Mr. Le Cong Co
  (Rector of Duy Tan University)
- Opening speech by Prof. Acad. Nguyen Van Hieu
  (Conference President)
- Speech by Prof. Dr. YongTak Lee
  (Director. Advanced Photonic Research Ins., GIST, R. Korea)
- Speech by Prof. Dr. Valentin A. Orlovich
  (B.I. Stepanov Institute of Physics, NAS Belarus)
- Speech by Prof. Dr. Nobuhiko Sarukura
  (Institute of Laser Engineering, University of Osaka, Japan).

PLENARY SESSION

Chairperson:

Prof. M. Trippenbach *(University of Warsawa, Poland)*
Prof. Dinh Van Trung *(Institute of Physics, VAST, Vietnam)*

PL-01
09:30 - 10:05 **ULTRAFAST STRUCTURAL DEFORMATION OF MOLECULES BY COINCIDENCE MOMENTUM IMAGING AND LASER ASSISTED ELECTRON DIFFRACTION**

Kaoru Yamanouchi

School of Science, The University of Tokyo, Japan

PL-02
10:05 - 10:40 **NANOSTRUCTURES FOR IMPROVING THE PERFORMANCE OF OPTICAL DEVICES**

YongTak Lee, Yong Min Song, Chan Il Yeo, Eun Kyu Kang
School of Information and Communications,
Gwangju Institute of Science and Technology, Korea.

10:40- 10:55 Coffee break

Chairperson:

Prof. Ken'ichi Nakagawa *(University of Electro-Communication, Japan)*
Dr. Nguyen Thanh Binh *(Institute of Physics, VAST, Vietnam)*

PL-03
10:55 - 11:30

ENHANCEMENT OF LASING EMISSION IN THE METALLIC COATED MICROSPHERE CAVITY BASED ON Er-DOPED SILICA GLASSES

Pham Van Hoi, N. T. Anh, Bui Huy, N. T. Van, Tran Thi Cham

Institute of Material Science, VAST, Vietnam

PL-04
11:30 - 12:05

ATTRACTIVE NATURES IN A SET OF A HIGHLY DISCRETE COHERENT SPECTRUM

Masayuki Katsuragawa

Department of Engineering Science,
University of Electro-Communications, Japan

PL-05
12:05 - 12:40

Eu:KGd$(WO_4)_2$: NOVEL LASER AND NONLINEAR CRYSTAL

V.A. Orlovich, S.N. Bagaev, V.I. Dashkevich, N.V. Kuleshov

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

SESSION A:
PHOTONICS AND APPLICATIONS
August 13, 2014 (Tuesday)

<u>Chairperson:</u>

Prof. N. Sarukura ***(University of Osaka, Japan)***
Prof. Dinh Xuan Khoa ***(Vinh University, Vietnam)***

A-01
13:30 - 13:55

HIGH RESOLUTION TABLE TOP COHERENT DIFFRACTIVE IMAGING WITH AN EXTREME ULTRAVIOLET SOURCE

(invited talk)

Lap Van Dao, Khuong Ba Dinh, Hoang Vu Le and Peter Hannaford

Swinburne University of Technology, Melborne, Australia

A-02
13:55 - 14:20

PRESENT STATUS OF GEKKO-EXA PROJECT OF ILE, OSAKA UNIVERSITY

(invited talk)

M. Nakai and Gekko-EXA project team

The institute of Laser Engineering, Osaka University, Japan

A-03
14:20 - 14:35

COHERENT PI-ELECTRON ROTATIONS IN A NONPLANAR CHIRAL AROMATIC MOLECULE

H. Mineo, S.H. Lin and Y. Fujimura

Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei, Taiwan

A-04
14:35 - 14:50

SCALABLE AND LOW COST THz FILTER BASED ON U-SHAPED ARRAY FABRICATED VIA CONVENTIONAL PHOTOLITHOGRAPHY UTILIZING PHOTOMASK PRINTED USING A COMMERCIAL PRINTER

Mark Jayson Felix, Joselito Muldera, Armando Somintac, Arnel Salvador and Elmer Estacio

National Institute of Physics, University of the Philippines Diliman

A-05 **14:50 - 15:05**	**LUMINESCENT PROPERTIES OF ALKALINE EARTH SILICATE MATERIALS DOPED RARE EARTH** Tuat L.V., Linh D.T.D, Tien D.T., Thao L.T.T. *Department of Physics, Hue University of Science, Vietnam*
A -06 **15:05 – 15:20**	**ELECTROMAGNETICALLY INDUCED TRANSPARENCY IN A FIVE LEVEL CASCADE SYSTEM UNDER DOPPLER BROADENING** Pham Van Trong, Nguyen Manh An, Le Van Dai, Mai Van Luu, Dinh Xuan Khoa, Nguyen Huy Bang *Vinh University, Vietnam*
15:20 - 15:35	**Coffee Break**

Chairperson:

Prof. Pham Van Hoi ***(IMS, VAST, Vietnam)***
Dr. Myat Shwe Wad ***(University of Yangon, Myanmar)***

A-07 **15:30 - 15:55**	**ELECTROMAGNETIC PROPERTIES OF NEARLY SELF-COMPLEMENTARY METASURFACES AT TERAHERTZ FREQUENCY** *(invited talk)* Keisuke Takano, Yoku Tanaka, Abdalalah Chahadih, A. Ghaddar et al. *Institute of Laser Engineering, Osaka University, Japan*
A-08 **15:55 - 16:20**	**VACUUM ULTRAVIOLET FLUORESCENCE OF PEROVSKITE FLUORIDE CRYSTALS FOR SHORT WAVELENGTH APPLICATIONS** *(invited talk)* Nobuhiko Sarukura, Kohei Yamanoi, Ryosuke Nishi, Kohei Takeda, Yuki Shinzato, Mizuki Tsuboi, Mui Viet Luong et al. *Institute of laser engineering, Osaka University, Japan*

A-09
16:20 - 16:45

QUANTUM MASS ACQUISITION IN SPINOR BOSE-EINSTEIN CONDENSATES

(invited talk)

N.T. Phuc, Y. Kawaguchi, M. Ueda

Center for Emergent Matter Science (CEMS), RIKEN , Japan

A-10
16:45 - 17:00

LOW TEMPERATURE PHOTOLUMINESCENCE OF STRAINED GaAs/AlGaAs MQWS ON SAPPHIRE USING EPITAXIAL LIFT-OI TECHNIQUE

Jessica Afalla, Karim Omambac, John Daniel Vasquez, E. Estacio et al.

National Institute of Physics, Philippines

A-11
17:00 - 17:15

CONTROLLING OPTICAL BISTABILITY IN A FIVE-LEVEL CASCADE EIT MEDIUM

Le Thi Minh Phuong, Le Van Doai, Dinh Xuan Khoa, N. Huy Bang

Vinh University, Vietnam

A-12
17:15 - 17:30

RELATION OF THE COMPOSITION, PARTICLE SIZE AND PHOTOLUMINESCENCE IN SnO_2/SiO_2 NANOCOMPOSITE DOPING WITH Eu^{3+} IONS

Bui Quang Thanh, Ngo Ngoc Ha, Pham Son Tung, Tran Ngoc Khiem

ITIMS, HUST, Vietnam

SESSION A

PHOTONICS AND APPLICATIONS

August 14, 2014 (Thursday)

Chairperson:

Prof. K. Yamanouchi ***(University of Tokyo, Japan)***
Dr. Nguyen Thanh Binh ***(Institute of Physics, VAST, Vietnam)***

A-13 **08:30 - 08:55**

DEVELOPMENT OF HIGH COHERENCE 193 nm SOLID STATE LASER

(invited talk)

Tomoharu Nakazato, Mizuki Tsuboi, Takashi Onose, Yuichi Tanaka, Nobuhiko Sarukura, Shinji Ito, Kouji Kakizaki, and Shuntaro Watanabe

Tokyo University of Science, Japan

A-14 **08:55 - 09:20**

EIT IN LAMBDA CONFIGURATION: MULTI-LEVEL MODEL AND MODEL WITH STRUCTURED CONTINUA

(invited talk)

Bui Dinh Thuan, Cao Long Van, Doan Quoc Khoa, Wieslaw Leonski

University of Zielona Gora, Poland

A-15 **09:20 - 09:35**

SYNTHESIS AND LUMINESCENCE PROPERTIES OF SiO_2-SnO_2 AND SiO_2-ZnO NANOCOMPOSITE FILMS DOPED WITH RARE EARTH IONS (Eu^{3+}, Er^{3+})

Tran Ngoc Khiem, Ngo Ngoc Ha, Bui Quang Thanh, Nguyen Thi Hien, Ho Van Chuong, Pham Son Tung, Nguyen Van Du, Nguyen Duc Chien

ITIMS, HUST, Hanoi, Vietnam

A-16 **09:35 - 09:50**

INTERPLAY BETWEEN STRAINS AND DEFECTS IN HIGH POWER DIODE LASERS

Tran Quoc Tien, Thanh-Phuong Nguyen and Jens W. Tomm

Institute of Material Science, VAST, Vietnam

A-17 **09:50 - 10:05**

DEVELOPMENT OF SURFACE ENHANCED RAMAN SCATTERING PLATFORM FROM HARVESTED SILICON NANOWIRES

E. Anguluan, Philippe Tingzon, Niel Gabriel Saplagio, J. C. Ragasa, Arnel Salvador and Armando Somintac

University of the Philippines – Diliman, Philippines

A-18
10:05 - 10:20

TRADEOFF BETWEEN NARROWING OPTICAL BAND GAP AND ENHANCING ELECTRICAL CONDUCTIVITY OF Au/Ag NANOPARTICLE MODIFIED TITANIUM OXIDE FILMS

Aung Chan Thar, Thaung Hlaing Win, Zaw Myo Win, Nyein WintLwin & Than Zaw Oo

Department of Physics, University of Mandalay, Myanmar

10:20 - 10:35 **Coffee break**

<u>Chairperson:</u>

Prof. Yong Tak Lee *(Korea)*
Dr. Nguyen Huy Bang *(Vinh University, Vietnam)*

A-19
10:35 - 11:00

QUEST FOR SOLITONS

(invited talk)

Marek Trippenbach, Boris Malomed, Eryk Infeld, Cao Long Van, Nguyen Viet Hung

Institute of Theoretical Physics, University of Warsawa, Poland

A-20
11:00 - 11:25

PREPARATION AND CHARACTERIZATION OF CdS/CdO THIN FILM

(invited talk)

Myat Shwe Wad, Thida Lwin, Aye Aye Thant & Pho Kaung

University of Yangon, Myanmar

A-21
11:25 - 11:40

FABRICATION OF MICRO-CHANNELS IN SILICON CARBIDE USING FEMTOSECOND LASER IRRADIATION AND ACID ETCHING

Van Thanh Khuat, Jinhai Si, T. Chen, Than V. N., Luu D. V., Xun Hou

Xian Jiaotong University, Xian, China

A-22 **11:40 - 11:55** **CONTROLLING SELF – KERR NONLINEARITY IN MULTI LEVEL CASCADE EIT SYSTEMS**

Le Van Doai, Le Thi Minh Phuong, Dinh Xuan Khoa, N. Huy Bang

Vinh University, Vietnam

A-23 **11:55 - 12:10** **EFFECT OF LIGHT INTENSITY AND ANNEALING SEQUENCE ON PHOTOCONDUC-TIVITY OF TITANIUM DOPED NICKEL OXIDE**

Sauswang, Min Min Thein, NyeinWintLwin & Than ZawOo

Department of Physics, University of Mandalay, Myanmar

A-24 **12:10 - 12:25** **CHARGE TRANSPORT PROPERTIES OF HETEROJUNCTIONS IN NANOCOMPOSITES USED FOR ORGANIC SOLAR CELLS**

Nguyen Nang Dinh, Tran Thi Thao, Tran Si Trong Khanh, T. Q. Trung

University of Engineering and Technology, VNU Hanoi, Vietnam

12:25 – 13:30 **BUFFER LUNCH**

Chairperson:

Prof. Nguyen Nang Dinh *(VNU Hanoi, Vietnam)*
Dr. Saw Lin Oo *(University of East Yangon, Myanmar)*

A-25 **13:30 - 13:55** **MANIPULATING ULTRA COLD ATOMS TOWARD THE DEVELOPMENT OF QUANTUM TECHNOLOGIES**

(invited talk)

Kenichi Nakagawa

Institute for laser science, University of Electro-Communication, Japan

A-26 **13:55 - 14:20** **POSSIBILITY OF GENERATION AND AMPLIFICATION TO HIGH POWER OF ULTRAVIOLET SHORT PULSE Ce:LiCAF LASER EMISSION**

(invited talk)

Pham Hong Minh, Pham Van Duong, Pham Huy Thong, Nguyen Van Hao, Do Quoc Khanh, Nobuhiko Sarukura, N. Dai Hung

Institute of Physics, VAST, Hanoi, Vietnam

A-27 **14:20 - 14:35**

HIGH ORDER HARMONIC GENERATION WITH TWO COLOR LASER FIELDS

Dinh Ba Khuong, Le Vu Hoang, Peter Hannaford, D. Van Lap

Swinburne University of Technology, Australia

A-28 **14:35 - 14:50**

MEASURING VISCOSITY OF A LIQUID USING VIDEO MICROSCOPY OF BROWNIAN MOTION OF MICRO-SIZE PARTICLES IN AN OPTICAL TRAP

Phan Van Thuan, Nguyen Huy Bang

Vinh University, Vinh City, Vietnam

A-29 **14:50 - 15:05**

NUMBER DENSITY DEPENDENCE ON SURFACE ENHANCED RAMAN SCATTERING USING GOLD NANOSPHERE AND GOLD NANOROD

Le Dac Tuyen, Du Thi Xuan Thao, L.Q. Minh, Chia Chen Hsu

Hanoi University of Mining and Geology, Hanoi, Vietnam

A-30 **15:05 - 15:20**

MICROWAVE PHOTONIC SYSTEM APPLIED TO REFRACTIVE INDEX MEASUREMENT

Pham Toan Thang, Bernard Journet, Vu Doan Mien, Tran Quoc Tien, Vu Van Yem

LPQM, ENS Cachan CNRS, France

15:20 – 15:35 **Coffee break**

Chairperson:

Prof. V.A. Orlovich *(Stepanov Institute of Physics, Belarus)*
Prof. Dinh Van Trung *(Institute of Physics, VAST, Vietnam)*

A-31 **15:35 - 16:00**

A REVIEW ON THE STATUS OF TERAHERTZ TIME DOMAIN SPECTROSCOPY RESEARCH IN THE PHILIPPINES

(invited talk)

E. Estacio, Armando Somintac, Arnel Salvador

University of the Philippines – Diliman, Philippines

A-32 **16:00 - 16:25**

QUANTUM OPTICS WITH QUANTUM DOTS ON OPTICAL NANOFIBERS

(invited talk)

R. Yalla, M. Sadgrove, K.P. Nayak, K. Hakuta

Center for Photonic Innovations, University of Electro-Communications, Japan

A-33 **16:25 - 16:40**

TERAHERTZ EMISSION OF POROUS SILICON

M. Angela B. Faustino, Arvin I. Mabilangan, Lorenzo P. Lopez Jr., Joselito Muldera, Niel Gabriel Saplagio, Elmer S. Estacio and Armando S. Somintac

National Institute of Physics, University of the Philippines - Diliman, Philippines

A-34 **16:40 - 16:55**

OPTICAL SPACER-INDUCED ABSORPTION ENHANCEMENT IN POLYCARBAZOLE BASED ORGANIC SOLAR CELLS STUDIED BY FDTD OPTICAL SIMULATION

Sandar Win, NyeinWintLwin and Than ZawOo

Department of Physics, Mandalar College, Mandalay, Myanmar

16:45 – 17:30 **POSTER I**

SESSION A

PHOTONICS AND APPLICATIONS

August 15, 2014 (Friday)

Chairperson:

Prof. E. Estacio *(University of the Philippines – Diliman)*
Dr. Chu Manh Hoang *(HUST, Vietnam)*

A-35 **8:30 - 8:55** **NONLINEAR QUANTUM SCISSORS AND ENTANGLEMENT GENERATION**

(invited talk)

Nguyen Van Hoa, Nguyen Manh An, Nguyen Thi Dung, Cao Long Van & Wieslaw Leonski

University of Zielona Gora, Poland

A-36 **8:55 - 9:20** **GaAs-AlGaAs CORE-SHELL NANOWIRES FOR THz APPLICATIONS**

(invited talk)

Armando S. Somintac

University of the Philippines – Diliman, Philippines

A-37 **09:20 - 9:35** **INTENSITY DISTRIBUTION OF VIBRATIONAL TRANSITIONS IN THE BAND SYSTEM OF NaLi MOLECULE**

Le Canh Trung, Dinh Xuan Khoa, Le Nguyen Thuy An, Nguyen Tien Dung and Nguyen Huy Bang

Vinh University, Vinh City, Vietnam

A-38 **09:35 - 9:50** **COMBINED DEPOSITION TECHNIQUES OF Si:H THIN FILMS WITH EMBEDDED NANOPARTICLES AS A PERSPECTIVE FOR PHOTONICS, PHOTOVOLTAIC OR EVEN THERMOELECTRIC APPLICATIONS**

J. Stuchlik, The Ha Stuchliková, Zdenek Remes, Radek Fajgar,
Pham Minh Tien, Nikolay G. Galkin

Institute of Physics ASCR, Czech republic

A-39 **09:50 - 10:05** **PROPERTIES OF SILICON CARBIDE THIN FILMS PREPARED BY PECVD**

Chandany Sen, Jong – Ick Son, Nam-Hee Cho

Faculty of Science, RUPP, Cambodia

A-40 **10:05 - 10:20** **CATHODOLUMINESCENCE PHOTOLUMINESCENCE OF Y_2O_3: Eu^{3+} NANOPHOSPHOR**

Tran Kim Anh, Pham Thi Minh Chau, Pham Thi Viet Ha and Nguyen Thi Quy Hai

Duy Tan University, Da Nang, Vietnam

10:20 – 10:35 **Coffee break**

10:35 – 11:35 **POSTER II**

Chairperson:

Prof. Cao Long Van *(University of Zielona Gora, Poland)*
Prof. A. Somintac *(University of Philippines – Diliman, Philippines)*

A-41 **13:30 - 13:55** **INFLUENCE OF AN ANTI-REFLECTIVE LAYER ON THE PHOTOVOLTAIC EFFICIENCY OF SiO2/Si SOLAR CELL**

(invited talk)

Saw Lin Oo, Zayar Thu, Than Zaw Oo and Pho Kaung

Department of Physics, University of East Yangon, Myanmar

A-42 **13:55 - 14:10** **CHANGING GRAPHENE PROPERTY WITH EPOXY GROUP BY UV-OZONE TREATMENT AND OXIDIZING SOLUTION**

Dinh Son Thach, Pham Thi Hong Nhung, Huynh Minh Nhut, Nguyen Thi Thu Hien, Dương Dinh Loc, Vu Van Quang, Hoang Thi Kim Dung

University of Natural Science - VNU HCMC, Hochiminh City

A-43 **14:10 - 14:25** **MULTI-CHANNEL MICROELECTRO - MECHANICAL TUNABLE MICRO-RING RESONATOR FILTER**

Chu Manh Hoang and Kazuhiro Hane

ITIMS, HUST, Hanoi, Vietnam

A-44 **14:25-14:40** **EFFECTS OF NONLINEAR ABSORPTION AND THIRD-ORDER DISPERSION ON SOLITON PROPAGATION IN OPTICAL FIBER**

Hoang Minh Dong, Do Thanh Thuy, Dinh Xuan Khoa and Bui Dinh Thuan

Vinh University, Vinh city, Vietnam

A-45 **14:40-14:55** **OPTICAL PROPERTIES OF ALKALI ALUMINOBORATE GLASS DOPED Eu^{3+} ION**

Ha V. T. T, Thanh N. T and Dam P. T

Institute of Materials Science, VAST, Hanoi

A-46 **14:55-15:10** **CONTROLLING NEGATIVE INDEX OF REFRACTION IN AN ATOMIC GASEOUS EIT MEDIUM**

Tran Manh Cuong, Le Van Dai, Vu Ngoc Sau, N. Huy Bang

Vinh University, Vietnam

15:10 - 15:25 **Coffee break**

PLENARY SESSION

(Conference Hall: 713)

Chairperson

Prof. Vu Xuan Quang *(Duy Tan University, VietNam)*
Prof. Nguyen Dai Hung *(IOP, VAST, VietNam)*

PL-06 **15:25-16:00** **RESEARCH PROGRESS OF THE UNIVERSITY OF ELECTRO-COMMUNICATIONS, TOKYO, JAPAN**

Wataru Mitsuhashi and Masayuki Katsuragawa

The University of Electro-Communications, Tokyo, Japan.

PL-07 **16:00-16:35** **INTRODUCTION TO DUY TAN UNIVERSITY**

Le Cong Co

Duy Tan University, Da Nang

16:35 **CLOSING REMARK**

SESSION B:

QUANTUM PHOTONICS AND NANOPHYSICS

August 13, 2014 (Tuesday)

Chairperson:

Prof. Vu Xuan Quang, ***(Duy Tan University, Da Nang)***
Dr. Chu Viet Ha ***(Thai Nguyen University of Education, Thai Nguyen)***

B-01
13:30 - 13:55

PRESSURE-INDUCED POLAR PHASES IN RELAXOR MULTIFERROIC $PbFe_{0.5}Nb_{0.5}O_3$

(invited talk)

N. T. Dang, D. P. Kozlenko, S. E. Kichanov, E. V. Lukin, L. S. Dubrovinsky, et al.

Duy Tan University, Da Nang.

B-02
13:55 - 14:20

$CuWO_4$/SbA-15 COMPOSITE PREPARED USING MICROWAVE ASSISTED METHOD AND ITS PHOTOCATALYTIC ACTIVITY

(invited talk)

Pham Van Hanh, Le Ngoc Minh, Vu Tuan Anh, Nguyen Dang Phu and Luc Huy Hoang

Hanoi National University of Education, Hanoi, Vietnam.

B-03
14:20 - 14:35

INVESTIGATION AND SIMULATION OF THE CARRIER TRAPPING PROCESS AT Si-SiO_2 JUNCTION INTERFACE OF MOSFET DEVICES

Tran Quang Nguyen, Huynh Tri Phong, Tran Minh Dao, Tran Kim Huong, Tran Quang Trung

University Information Technology, VNU-HCMC, Ho Chi Minh

B-04
14:35 - 14:50

STUDY OF POLYMER QUENCHING PROPERTIES OF MEH-PPV/QDs HETEROJUNCTIONS USED FOR QUANTUM-DOT SOLAR CELLS (Q-SC)

Tran Thi Thao, Nguyen Thuy Nga, Vo-Van Truong, Nguyen Nang Dinh

Ho Chi Minh City Institute of Physics, VAST, Ho Chi Minh City

B-05 **14:50 - 15:05**

DYNAMICS OF DNA MOLECULES IN OPTICAL TWEEZER

Thai Dinh Trung, Chu Van Lanh, Hoang Dinh Hai, Ho Quang Quy

Vinh University, Vinh City, Vietnam

B-06 **15:05 - 15:20**

THEORETICAL AND EXPERIMENTAL STUDY OF ANATASE TiO_2 CODOPED WITH VANADIUM AND NITROGEN

Phung Nguyen Thai Hang, Truong Duc Nguyen, Duong Ai Phuong and Le Vu Tuan Hung

University of Natural Science, VNU HCMC, Hochiminh City

15:20 - 15:35 **Coffee break**

Chairperson:

Prof. Huyng Thanh Dat *(VNU HCMC, Hochminh City)*
Prof. Nguyen Manh Son *(Hue universit, Hue City)*

B-07 **15:35 - 16:00**

RESEARCH AND CREATION OF RAMAN REFERENCE SPECTRA FOR INVESTIGATING REVELANT ACTIVE PHARMACEUTICAL INGREDIENTS AND DRUGS

(invited talk)

Doan Cao Son, Tran Viet Hung, Bui Van Trung, Nguyen Ngoc Trung and Vu Thi Bich

Vietnam national institute of drug quality control, Hanoi

B-08 **16:00 - 16:25**

A STUDY OF FLASH-LAMP PUMPED PASSIVELY Q-SWITCHED Nd:YAG / Cr:YAG LASERS

(invited talk)

Phan Nguyen Nhue, Duong Chi Dung, Le Hoang Hai

Le Quy Don Technical University, Hanoi, Vietnam

B-09 **16:25 - 16:40**

THE STUDY OF POTASSIUM CHLORIDE (KCl) AND ORGANIC DYES EFFECTS ON THE GROWTH OF KDP SINGLE CRYSTALS

Nguyen Thi Hoai Phuong, Phan Trung Vinh, Le Thi Quynh Anh

University of Science VNU-HCMC, Hochiminh City

B-10 **16:40 - 16:55**

THE DYNAMIC RESISTANCE OF CdS/CdSe/ZnS CO-SENSITIZED TiO_2 SOLAR CELLS

Tung Thanh HA, Quang Vinh LAM , Thanh Dat HUYNH

Dong Thap University, Dong Thap, Vietnam

B-11 **16:55 - 17:10**

DETERMINATION OF PROPERTIES OF CVD DIAMOND DETECTOR BY USING PENELOPE

Luu Thi Thuy Hoa, Ly Anh Tu

University of Technology, Ho Chi Minh City

B-12 **17:10 - 17:25**

CELLULAR AUTOMATON ALGORITHMS APPLIED TO STUDY ON STRUCTURE OF LUMINESCENCE LEVELS OF NANOMATERIALS

Lam Thi Kieu Giang, Khuong Thanh Tuan

Institute for Nucear Science and Technology, Hanoi, Vietnam

SESSION B:

QUANTUM PHOTONICS AND NANOPHYSICS

August 14, 2014 (Thursday)

Chairperson:

Prof. Duong Ai Phuong (*VNU HCMC, Hochiminh City)*
Dr. Ngo Thi Hong Le *(IMS, VAST, Hanoi)*

B-13
08:30 - 08:55

UNUSUAL LUMINESCENCE DYNAMICS OF Dy^{3+} - DOPED TELLURITE BASED GLASSES: A CORRECTION FORJUDD-OFELT ANALYSIS TO THE THERMALLY POPULATED EXCITATION LEVELS

(invited talk)

Vu Xuan Quang, Seng Thoong, Vu Phi Tuyen, Ho Van Tuyen,
Phan Van Do, Nguyen Trong Thanh, Ngo Van Tam

Duy Tan University, DaNang

B-14
08:55 - 09:20

INFLUENCE OF FREQUENCY CHIRP ON PULSE PARAMETERS FOR THE SUPER-GAUSSIAN SHAPE LIGHT PULSE IN THE SATURABLE ABSORBER AND ACTIVE MEDIUM OF THE RING RESONATOR OF THE COLLIDING PULSE MODE LOCKING DYE LASER

(invited talk)

Trinh Dinh Chien, Nguyen Thanh Nhon, Giang Manh Khoi

University of Science, VNU-Hanoi, Hanoi,Vietnam

B-15
09:20– 09:35

INVESTIGATION OF TIO2 FILMS FOR QUANTUM DOT SOLAR CELLS

Ngo Hai Dang, Vo Thi Ngoc Thuy, L. Q. Vinh, D. Ai Phuong

University of Natural Science, VNU- HCMC, Hochiminh City

B-16
09:35 – 9: 50

GOLD NANOPARTICLE-DOPED POLYMER-DYE LASER MEDIUM

Nguyen Thi My An, Nghiem Thi Ha Lien, Nguyen Thi Thanh Thuy,
Vu Thi Thuy Duong, Vu Duong, Do Quang Hoa

Institute of Physics, VAST, 10 Dao Tan – Ba Dinh – Ha Noi

B-17 **9:50 – 10: 05** **SYNTHESIS, OPTICAL PROPERTIES OF CdSeTe TERNARY ALLOY QUANTUM DOTS AND NATURAL DYE CURCUMIN**

Le Xuan Hung, Pham Nam Thang, Hoang Van Nong, Nguyen Hai Yen, Dinh Hung Cuong, Nguyen Thi Thuc Hien, P.Thu Nga

Duy Tan University, Da Nang

B-18 **10:05 - 10:20** **SYNTHESIS AND INVESTIGATION THERMOLUMINESCENT PROPERTIES OF K_2GdF_5:Tb**

Ha Xuan Vinh, Nguyen Chi Thang, Doan Phan Thao Tien, Nguyen Thi Minh Nguyet

Nhatrang Ins. of Tech. Res.&App (NITRA), Nhatrang

10:20 - 10:35 **Coffee break**

Chairperson:

Prof. Tran Quang Trung (***VNU HCMC, Ho Chi Minh City)***
Dr. Tran Thi Chung Thuy (*Water resources University, Hanoi)*

B-19 **10:35 - 11:00** **HYDROTHERMAL SYNTHESIS AND PHOTOLUMINESCENCE PROPERTIES OF ZnO NANORODS**

(invited talk)

Nguyen Tri Tuan, D. H. Nguyen, Nguyen Tu, Do Quang Trung, Vu Thi Hang, Le Van Nhan, Nguyen Thi Bup, Pham Thanh Huy

College of Sciences, Cantho University, Can Tho City

B-20 **11:00 - 11:25** **A COMPACT POCKEL CELL UNIT FOR Q-SWITCHING Nd:YAG LASER**

(invited talk)

Dinh Van Trung, Dam Trung Thong, Pham Van Thai

Institute of Physics, VAST , 10 Dao Tan, Ba Dinh, Hanoi

B-21 **11:25 - 11:40** **ENERGY TRANSFER STUDIES OF Eu^{3+} IONS DOPED TELLUROBORATE GLASSES**

Tran Thi Chung Thuy, Tran Thi Hong, Phan Van Do

Water resources University, Hanoi, Vietnam.

B-22 **11:40 - 11:55**

PROPERTIES PHOTOCATALYST OF ZnO/TiO_2 HETEROJUNCTION MODIFIED BY DILUTED HCl SOLUTION

Duong Chien Si Nhiem, Le Thi Ngoc Tu, Vu Thi Hanh Thu

University of Natural Science, VNU-HCMC, Hochiminh City

B-23 **11:55 - 12:10**

ABSORPTION AND PHOTOLUMINESCENCE PROPERTIES OF CdSe/CdS CORE/SHELL NANOSTRUCTURES WITH THICK SHELL

Le Anh Thi, Nguyen Thi Luyen, N. Xuan Nghia, Vu X. Quang

Duy Tan University, DaNang, Vietnam

B-24 **12:10 - 12:35**

STUDY DEPOSITION OF SiO_X FILM BY PECVD

Pham Hong Tuan, Nguyen Thanh Hop, Nguyen Duy Hong

National Center for Technology Progress- NACENTECH

12:35 - 13:30 **BUFFER LUNCH**

<u>Chairperson:</u>

Prof. Pham Thu Nga (*IMS, VAST, Hanoi)*
Dr. Vu Thi Hanh Thu (*VNU HCMC, Hochiminh City)*

B-25 **13:30 - 13:55**

SPECTROSCOPIC CHARACTERISTIC OF Ba_2SiO_4: Eu^{2+} GREEN EMITTING PHOSPHOR

(invited talk)

Nguyen Manh Son, Pham Thi Ngan, Nguyen Quang Khanh,
Le Thi Cam Lai

Hue University, Hue City

B-26 **13:55 - 14:20**

ON DYNAMICS OF THE FAST Er-RELATED PHOTOLUMINESCENCE MEDIATED BY Si QUANTUM DOTS

(invited talk)

Ngo Ngoc Ha and Tom Gregorkiewicz

ITIMS, HUST, Hanoi, Vietnam

B-27 **14:20 - 14:35** **AN ENSEMBLE SOLITARY PULSE TRAIN IN BACKWARD STIMULATED RAMAN SCATTERING**

Thang Nguyen, Bien Chu, Amir Abdovand, Alexander Nazarkin

Military Academy of science and technology, Hanoi, Vietnam.

B-28 **14:35 - 14:50** **SPECTROSCOPIC INVESTIGATIONS ON THE STRUCTURE AND OPTICAL PROPERTIES OF TIN-SILICA GLASS CERAMIC MONOLITHS DOPED WITH Eu^{3+} IONS**

Tran T. T. Van, Pham Kim Ngoc, Ta Thi Kieu Hanh, Le Van Hieu, Lam Quang Vinh

University of Natural Science, VNU- HCMC, Hochiminh City

B-29 **14:50 - 15:05** **SPECTRAL STUDIES OF Dy AND Ce IONS DOPED IN THE ALKALI BORATE GLASSES**

Tran Van Phu, Tran Ngoc, Phan Van Do, Nguyen Manh Son

Hue University, Hue City, Vietnam,

B-30 **15:05 - 15:20** **DEVELOPMENT OF A RAMAN LIDAR SYSTEM FOR STUDYING THE ATMOSPHERIC HUMIDITY**

Nguyen Xuan Tuan, Dinh Van Trung, Nguyen Thanh Binh, Bui Van Hai

Institute of Physics, VAST, Hanoi, Vietnam

15:20 - 15:35 **Coffee break**

Chairperson:

Prof. Nguyen Minh Thuy *(HNUE, Hanoi)*
Dr. Nguyen Manh An *(Hong Duc University, Thanh Hoa)*

B-31 **15:35 - 16:00** **A STUDY OF CO ABSORPTION ON THE ANATASE TiO_2 (001) SURFACE**

(invited talk)

Minh Thuy Nguyen, Minh Huong Nguyen, Duong Quoc Van, Nguyen Tien Cuong and Pham Tien Lam

Hanoi National University of Education, Hanoi, Vietnam

B-32
16:00 - 16:15

USING SPECTROSCOPY TO STUDY OF OPTICAL PROPERTIES OF PHOTOANODES FILMS FtO/TiO_2/CdS/CdSe/ZnS FOR QUANTUM DOTS SOLAR CELL

Huynh Chi Cuong, Nguyen Ngoc Thanh Vy, L. Q. Vinh, Vu Xuan Quang

University of Natural Science, VNU-HCMC, Hochiminh City

B-33
16:15 - 16:30

OPTICAL PROPERTIES OF Dy^{3+} IONS IN ALKALI METAL BORATE GLASSES GLASS

Tran Ngoc

Quang Binh University, Dong Hoi, Quang Binh

B-34
16:30 - 16:45

INVESTIGATING CHARACTERISTICS OF INORGANIC – ORGANIC HETEROGENEOUS STRUCTURE FOR HYBRID SOLAR CELL

Le Khac Top, Le Van Hieu

University of Natural Science, VNU-HCMC, Hochiminh City

16:45 - 17:30 **POSTER I**

SESSION B:
QUANTUM PHOTONICS AND NANOPHYSICS
August 15, 2014 (Friday)

Chairperson:

Prof. Nguyen Xuan Nghia (*IMS, VAST, Hanoi)*
Dr. Le Tran *(VNU HCMC, HoChiMinh City)*

B-35
08:30 - 08:55

SYNTHESIS AND OPTICAL PROPERTIES OF CdSe /CdS QUANTUM DOTS – BASED FLUORESCENCE SILICA NANOPARTICLES (CdSe/CdS@SiO_2) BY A GREEN ROUTE

(invited talk)

Chu Viet Ha, Nguyen Thi Bich Ngoc, Nghiem Thi Ha Lien,
Vu Thi Kim Lien and Tran Hong Nhung

Thai Nguyen University of Education, Thai Nguyen

B-36
08:55 - 09:20

ULTRASONIC SPRAY PYROLYSIS OF In_2S_3 BUFFER LAYERS FOR CU(In,AL)S_2 SOLAR CELL

(invited talk)

Nguyen Duc Hieu, Tran Thanh Thai, Vo Thi Thanh Tuyen,
Huynh Duc Hoan, Luu Thi Lan Anh, Vu Thi Bich and Vo Thach Son

Quy Nhon University, Binh Dinh

B-37
09:20 - 09:35

STRUCTURE AND OPTICAL PROPERTIES OF SPUTTERED CHROMIUM OXIDE THIN FILMS

Kim Ngoc Pham, Trung Do Nguyen, Cao Vinh Tran, Bach Thang Phan

University of Natural Science, VNU-HCMC, Hochiminh City

B-38
09:35 - 09:50

CONTROLING OF THE OPTICAL PROPERTIES OF COLLOIDAL GRADIENTLY ALLOYED $Zn_xCd_{1-x}S$ NANOCRYSTALS BY MOLAR RATIOS Zn/Cd

Hoang Thi Lan Huong, Nguyen Anh Tu, Pham Minh Kien,
Nguyen Thi Thuy Lieu, Nguyen Xuan Nghia

Post and Telecommunications Institute of Technology, Hanoi

B-39 **09:50 - 10:05**

EFFECT OF THE a-Si:H PASSIVATION LAYER ON CRYSTALLINE-AMORPHOUS SILICON HETEROJUNCTION SOLAR CELLS

Pham Hoai Phuong, Pham Dang Khoa, Pham Van Phat,
Nguyen Van Thang, Tran Quang Trung

University of Natural Science, VNU- HCMC, Ho Chi Minh City

B-40 **10:05 - 10:20**

SURFACE ENHANCED RAMAN SCATTERING BY METAL NANOPARTICLES

Quang Dong Nguyen, The Binh Nguyen, Thi Huong Au, Thi Hong Do

Thai Nguyen University, Thai Nguyen City, Vietnam

10:20 - 10:35 **Coffee break**

<u>Chairperson:</u>

Dr. Le Vu Tuan Hung *(VNU HCMC, Hochiminh City)*
Dr. Dang Ngoc Toan, *(Duy Tan University, Da Nang)*

B-41 **10:35 - 11:00**

FITC DOPED SILICA NANOPARTICLES WITH DNA FOR BREAST CANCER CELL IMAGING

(invited talk)

Vu Van Son, Nguyen Thi Thuy, Tran Anh Duc, Hoang Thi My Nhung,
Bui thi Van Khanh, Nguyen Dac Tu, Phan Thi Ngoc, Vu Thi Thuy Duong,
Le Quang Huan and Tran Hong Nhung

Institute of Physics, Vietnam VAST, Hanoi

B-42 **11:00 - 11:15**

RESEARCH A EFFICIENCY OF ERBIUM GLASS LASER PUMPED BY FLASH LAMP WITH THE ACTIVE MEDIUM IS YTTERBIUM-ERBIUM PHOSPHATE GLASS

(invited talk)

Giang Manh Khoi, Do Xuan Tien, Trinh Dinh Chien

NACENTEC, Hanoi , Vietnam

B-43
11:15 - 11:30

PHOTOLUMINESCENCE PROPERTIES OF $BaMgAl_{10}O_{17}$ DOPED Mn^{2+} FOR BLUE-LED BY COMBUSTION METHOD

Pham Nguyen Thuy Trang, Nguyen Manh Son, Nguyen Quang Liem

Hue University, Hue City, Vietnam

11:30 - 12:30 **POSTER II**

12:30 - 13:30 **BUFFER LUNCH**

Chairperson:

Prof. Luc Huy Hoang, *(HNUE, Hanoi)*
Dr. Nghiem Thi Ha Lien, *(IOP, VAST, Hanoi)*

B-44
13:30 - 13:50

OPTICAL PROPERTIES OF Au NANOPARTICLES DISPERSED ON TiO_2 FILMS BY VACUUM EVAPORATION METHOD

(invited talk)

Pham Duy Long, Do Thi Phuong, Le Ha Chi, Do Xuan Mai, Hoang Vu Chung, Nguyen Nhu Quynh, Nguyen Thi Tu Oanh, Nguyen Thi Thuy, Vu Van Cat

Institute of Materials Science, VAST, Hanoi, Vietnam.

B-45
13:50 - 14:10

PROPERTIES OF PbS NANOCRYSTALS PREPARED BY ELECTROCHEMICAL AND SONO-ELECTROCHEMICAL METHOD

(invited talk)

Sai Cong Doan, Nguyen Viet Tuyen

Hanoi University of Science VNU Hanoi, Hanoi city, Vietnam

B-46
14:10 - 14:25

SETUP LASER – MICRO TOTAL ANALYSIS SYSTEM (µTAS) TO DETERMINE THE FLUORESCENT DYE CONCENTRATION IN SOLUTION

Tran Hong Nhan, Thap Thi Kim Huynh, Tran Quang Nguyen, Nguyen Nang Dinh, Tran Quang Trung

University of Natural Science, VNU-HCMC, Hochiminh City

B-47
14:25 - 14:40

SYNTHESIS OF TiO_2-SiO_2 POWDER BY SOL-GEL METHOD

Vu Duc Chinh, Nguyen The Anh, Nguyen Quoc Trung

Institute of Materials Science, VAST, Hanoi, Vietnam.

B-48
14:40 – 14:55

MEASURING LUMINESCENCE FROM SINGLE NANOPARTICLES IN A CONFOCAL SETUP COMBINED WITH A COMPACT 2D NANOPOSITIONING STAGE

Dinh Van Trung, Nguyen Thi Thanh Bao, Tran Ngoc Hung

Institute of Physics, VAST, Hanoi, Vietnam

B-49
14:55 - 15:10

INVESTIGATING ELECTRICAL AND OPTICAL PROPERTIES OF Sb-DOPED ZnO THIN FILMS FARICATED BY SOLGEL SPIN-COATING METHOD

Dao Anh Tuan, Nguyen Nhat Quang, Vuong Nguyen Phuong Loan,
Le Vu Tuan Hung

University of Natural Science VNU-HCMC, Hochiminh City

15:10 - 15:25 **Coffee break**

PLENARY SESSION

(Conference Hall: 713)

Chairperson

Prof. Vu Xuan Quang (*Duy Tan University, VietNam*)
Prof. Nguyen Dai Hung (*IOP, VAST, VietNam*)

PL-06
15:25-16:00

RESEARCH PROGRESS OF THE UNIVERSITY OF ELECTRO-COMMUNICATIONS, TOKYO, JAPAN

Wataru Mitsuhashi and Masayuki Katsuragawa

The University of Electro-Communications, Tokyo, Japan.

PL-07
16:00-16:35

INTRODUCTION TO DUY TAN UNIVERSITY

Le Cong Co

Duy Tan University, Da Nang

16:35 **CLOSING REMARK**

SESSION C:

OPTICS, LASERS AND APPLICATIONS

August 13, 2014 (Tuesday)

Chairperson:

Prof. Tran Minh Thai ***(VNU HCMC, Ho Chi Minh)***
Prof. Nguyen Quynh Lan ***(HNUE, Hanoi)***

C-01
13:30 - 13:55

LASER RAMAN MICRO-SPECTROSCOPY AND CANCER RESEARCHES

(invited talk)

Pham Van Huong

University of Bordeaux, Bordeaux, French

C-02
13:55 - 14:20

COMBINING MULTI-SHOT AND SINGLE SHOT AUTOCORRELATION FOR ULTRASHORT LASER PULSE WIDTH MEASUREMENT

(invited talk)

Do Quoc Khanh, Pham Van Duong, Ngo Thi Huong, Nguyen Dinh Hoang, Pham Van Thai

Institute of Physics, VAST, Hanoi

C-03
14:20 - 14:35

DESIGN AND REALIZATION OF HIGH POWER MULTI-WAVELENGTH LED EQUIPMENT USING FOR BEAUTY CARE AND DERMATOLOGICAL TREATMENTS

Vu Ngoc Hai, Tran Quoc Tien, Thanh-Phuong Nguyen

Nguyen Tat Thanh University, HoChiMinh City

C-04
14:35 - 14:50

OPTIMIZATION OF DEPOSITION CONDITIONS OF CiS THIN FILMS USING RESPONSE SURFACE METHODOLOGY

Luu Thi Lan Anh, Tran Thanh Thai, Pham Phi Hung,
Mateus Manuel Netoa and Vo Thach Son

Hanoi University of Science and Technology, VNU Ha Noi

C-05
14:50 - 15:05

EFFECTIVE VISIBLE-LIGHT PHOTOCATALYTS OF CARBON NANOTUBES COATED BY TITANIUM NANOPARTICLES

Nguyen Cao Khang, Do Minh Thanh, Duong Quoc Van, V. T. M. Phuong, Phung Kim Phu, Nguyen Minh Thuy, Nguyen Van Minh

Hanoi National University of Education, Hanoi, Vietnam

C-06
15:05 - 15:20

BACTERICIDAL EFFECT OF LOW LEVEL SEMICONDUCTOR LASER WITH ENTEROCOCCUS FAECALIS IN THE INFECTED ROOT CANALS IN CARIES: IN VITRO STUDY

Bach Thanh Hai, Le Hoang Anh Vu, Tran Thi Ngoc Yen, Tran Minh Thai

University of Technology, Ho Chi Minh City

15:20 - 15:35 **Coffee break**

Chairperson:

Prof. Nguyen The Binh *(VNU Hanoi, Hanoi)*
Dr. Pham Hong Tuan, *(NACENTECH, Hanoi)*

C-07
15:35 - 16:00

COMPACT ELECTROMECHANICAL TUNABLE MICRO-RING RESONATOR ADD-DROP FILTER

(invited talk)

Chu Manh Hoang, Vu Ngoc Hung and Kazuhiro Hane

ITIMS, HUST, Hanoi, Vietnam

C-08
16:00 - 16:25

RESEARCH IN THE APPLICATION OF LOW POWER SEMICONDUCTOR LASER IN TREATMENT ATHEROMAS OF CAROTID ARTERY

(invited talk)

Tran Minh Thai, Can Van Be, Ngo Thi Thien Hoa, T. Thien Hau

University of Technology – VNU HCM, Ho Chi Minh City

C-09
16:25 - 16:40

GEOMETRY OPTIMIZATION OF HEAT SINK FOR HEAT DISSIPATION OF THE COB LEDs BY CFD THERMAL SIMULATION

Quan. C. X, Nhat N. V, Hung N. V, Trinh N.V , Hung N. P., Trung. N. N and Son V. T.

Hanoi University of Science and Technology, VNU Ha Noi,

C-10
16:40 - 16:55

PREPARATION OF SiO_2-COATED CdTe QUANTUM DOTS

Nguyen Thi Bich Ngoc, Chu Viet Ha, Vu Thi Thuy Duong,
Nguyen Quang Liem and Tran Hong Nhung

Institute of Physics, VAST, Hanoi

C-11
16:55 - 17:10

SYNTHESIS AND OPTICAL PROPERTIES OF Eu-DOPED $Sr_6B_5PO_{20}$ PHOSPHOR POWDERS PREPARED VIA CO-PRECIPITATION METHOD FOR PRODUCING WHITE LIGHT FLUORESCENT LAMPS

Le Tien Ha, Nguyen Duc Trung Kien, Pham Thanh Huy

ITIMS, HUST, Hanoi, Vietnam

C-12
17:10 - 17:25

DETERMINATION OF HIGH POWER DFB DIODE LASER PARAMETERS BASE ON AMPLIFIED SPONTANEOUS EMISSION SPECTRUM

Thanh-Phuong Nguyen, Tran Quoc Tien
Institute of Materials Science, VAST

SESSION C:

OPTICS, LASERS AND APPLICATIONS

August 14, 2014 (Thursday)

Chairperson:

Prof. Dao Tran Cao ***(IMS,VAST, Hanoi)***
Dr. Tran Ngoc, ***(Quang Binh University, Quang Binh)***

C-13
08:30 - 08:55

SIGNIFICANT ENHANCEMENT OF ROOM-TEMPERATURE LIGHT EMISSION IN Ge/Si EPILAYERS WITH APPLICATION OF TENSILE STRAIN AND HEAVY N-DOPING

(invited talk)

Luong Thi Kim Phuong, Nguyen Manh An, Le Thi Giang and Trinh Thi Mai

Hong Duc University, Thanh Hoa, Vietnam

C-14
08:55 - 09:20

DETERMINATION OF KINETIC PARAMETERS OF KYF_4:Sm

(invited talk)

Doan Tuan Anh

Institute of Materials Science, VAST, Hanoi, Vietnam

C-15
09:20– 09:35

FABRICATION OF SILVER NANOPARTICLE SET ON SILICON SURFACE FOR USING AS SURFACE-ENHANCED RAMAN SCATTERING ACTIVE SUBSTRATE

Luong Truc Quynh Ngan, Cao Tuan Anh, Le Van Vu and Dao Tran Cao

Institute of Materials Science, VAST, Hanoi, Vietnam

C-16
09:35 – 9: 50

COUPLING ANALYSIS BETWEEN ASYMMETRICAL OPTICAL WAVEGUIDES

Ha Sinh Nhat, Vu Ngoc Hung, and Chu Manh Hoang,

ITIMS, HUST, Hanoi, Vietnam

C-17
9:50 – 10: 05

MULTI-WAVELENGTH INVESTIGATION OF DIODE END-PUMPED SOLID-STATE Cr^{3+}:LiSAF LASERS PASSIVELY Q-SWITCHED WITH Cr^{4+}:YSO CRYSTAL

Nguyen Van Hao, Pham Hong Minh, Pham Van Duong, Nguyen The Binh and Nguyen Dai Hung

Institute of Physics, VAST, Hanoi, Viet Nam

C-18 **10:05 - 10:20**

USING ULTRAVIOLET RADIATION TO CONTROL THE SIZE OF ZINC OXIDE QUANTUM DODS MADE BY SOL-GEL METHOD

Dinh Son Thach, Pham Van Huynh

University of Technology, VNU-HCMC, Ho Chi Minh City

10:20 - 10:35 **Coffee break**

Chairperson:

Prof. Le Van Tuat *(Hue University, Hue City)*
Dr. Luong Thi Kim Phuong *(Hong Duc University, Thanh Hoa)*

C-19 **10:35 - 11:00**

EIT FOR Λ-LIKE SYSTEMS WITH DEGENERATE AUTOIONIZING LEVELS AND BROAD-BAND COUPLING LASER

(invited talk)

Doan Quoc Khoa, Cao Long Van, Nguyen Manh An, Nguyen Van Hoa, Nguyen Thi Hong and Le Duc Vinh

Quang Tri Teacher Training College, Quang Tri, Vietnam

C-20 **11:00 - 11:25**

STUDY ON THE OPITAL CHARACTERISTICS OF $CuInS_2$, $CuInS_2$/ZnS

(invited talk)

Tran Thi Kim Chi, Nguyen Thi Minh Thuy, N. Quang Liem

Institute of Materials Science, VAST, Hanoi

C-21 **11:25 - 11:40**

PHOTOLIMINESCENCE SPECTRA OF HYBRID STRUCTURE ZnO/GRAPHENE

Nguyen Quang Khoi, Le QuangToai, Vu Van Quang, Cao Van Phuoc, Duong DinhLoc and Dinh Son Thach

University of Natural Science, VNU-HCMC, Hochiminh City

C-22 **11:40 - 11:55**

PLASMONIC EFFECT OF GOLD NANOSHELLS IN TISSUE

Vu Thi Thuy Duong, Trinh Thi Thuong, Vu Van Son, Vu Duong, Nguyen Thi Thuy, Nghiem Thi Ha Lien, Do Quang Hoa and Tran Hong Nhung

Institute of Physics, VASST, Hanoi

C-23
11:55 - 12:10
PHOTOELECTRIC CHARACTERISTICS OF NANO TiO_2 FILM PREPARED BY SPRAYING PYROLYSIS METHOD

Tran Kim Cuong

Thu Dau Mot University, Thu Dau Mot City

C-24
12:10 - 12:35
PREPARATION OF GRAPHENE QUANTUM DOTS FOR OPTOELECTRONIC DEVICES FROM MULTIWALL CARBON NANO TUBES (MWCNT)

Hoang Thi Thu, Lam Minh Long, Nguyen Ngoc Phuong,
Huynh Tran My Hoa, Tran Quang Trung

University of Natural Science - VNU HCMC, Hochiminh City

12:35 - 13:30 **BUFFER LUNCH**

Chairperson:

Prof. Ho Quang Quy (*Military Academy of Sci. and Tech., Hanoi)*
Dr. Ha Xuan Vinh *(Nhatrang Ins. of Tech. Res.& App., VAST, Nhatrang)*

C-25
13:30 - 13:55
USING POLARIZATION SYSTEM TO EXTRACTTHE OPTICAL PROPERTIES OF GLUCOSE

(invited talk)

Thi-Thu-Hien Pham, Van Toi Vo, Quang-Linh Huynh, Thanh-Hai Le, Anh-Duy Nguyen, The-Trung Nguyen and Duy-Luan Nguyen

University of Technology, VNU-HCMC, Ho Chi Minh City

C-26
13:55 - 14:20
JUDD-OFELT CALCULATIONS FOR Eu^{3+} DOPED BORO - TELLURITE GLASSES

(invited talk)

Vu Phi Tuyen, Phan Van Do, Sengthong, Ngo Van Tam

Institute of Materials Science, VAST, Hanoi, Vietnam

C-27
14:20 - 14:35
RESEARCH AND DEVELOPMENT OF DIODE END-PUMPED SOLID-STATE Cr:LiSAF LASERS

Nguyen Van Hao, Pham Van Duong, Pham Hong Minh, Do Quoc Khanh, Antonio Agnesi, and Nguyen Dai Hung

Institute of Physics, VAST, Hanoi, Vietnam.

C-28 **14:35 - 14:50**

MAKING AND INVESTIGATION OF THE SECOND HARMONIC GENERATION EFFECT OF KDP SINGLE CRYSTALS

Phan Trung Vinh, Nguyen Thi Hoai Phuong, Le Thi Quynh Anh, Huynh Thanh Dat, Phan Thanh Nhat Khoa, Le Huynh Nguyen

University of Natural Science, VNU-HCMC, Hochiminh City

C-29 **14:50 - 15:05**

THE PROCESS OF IMMOBILIZATION OF ZnO NANORODS SURFACE WITH GALACTOSE OXIDASE – APPLY TO GALACTOSE BIOSENSOR

La Phan Phuong Ha, Ngo Van Chi Quang, Tran Quang Trung

University of Natural Science, VNU-HCMC, Hochiminh City

C-30 **15:05 - 15:20**

SYNTHESIS AND LUMINESCENT PROPERTIES OF RAVE EARTH DOPED PHOSPHATE GLASSES

Tuat L.V., Huong P.T.T., Tuan P.Q.

Hue University of Science, Hue City, Vietnam

15:20 - 15:35 **Coffee break**

<u>Chairperson:</u>

Dr. Nguyen Cong Thanh *(IOP, VAST, Hanoi)*
Dr. Nguyen Duy Hung, *(AIST, Ha Noi)*

C-31 **15:35 - 16:00**

EVALUATION OF SOME IMAGING TECHNIQUES FOR THE DETECTION OF VEIN IMAGING

(invited talk)

P.T.Dung, V.H.B.Khanh, T.V.Tien, P.T.H.Mien and H.Q.Linh

University of Technology, VNU-HCMC, Ho Chi Minh

C-32 **16:00 - 16:15**

NUCLEIC ACID STRIP BIOSENSOR BASED ON GOLD NANOPARTICLES FOR RAPID DETECTION OF BREAST CANCER ANTIGEN

(invited talk)

Pham Duc Minh, Vu Van Son, Le Thi Kim Xuan, Pham Van Phuc, Nghiem Thi Ha Lien, Le Quang Huan and Tran Hong Nhung

Institute of Physics, VAST, Hanoi

C-33 **16:15 - 16:30**

PREPARATION AND OPTICAL PROPERTIES OF THE TERNARY ALLOY QUANTUM DOTS FOR THE POTENTIAL APPLICATION IN SOLAR CELL

Pham Nam Thang, Nguyen Hai Yen, Dinh Hung Cuong, H. V. Nong, Vu Thi Hong Hanh, Le Xuan Hung, Khong Cat Cuong, Pham Thu Nga

Institute of Materials Science, VAST, Hanoi

C-34 **16:30 - 16:45**

PREPARATION OF HYBRID TRANSPARENT ELECTRODES OF SILVER NANOWIRES AND CHEMICALLY CONVERTED GRAPHENE ON ABITRARY SUBSTRATE AT LOW TEMPERATURE

Hoang Thi Thu, Huynh Tran My Hoa, Tran Quang Trung

University of Natural Science, VNU-HCMC, Hochiminh City

16:45 - 17:30 **POSTER I**

SESSION C:

OPTICS, LASERS AND APPLICATIONS

August 15, 2014 (Friday)

Chairperson:

Prof. Do Quang Hoa ***(IOP, VAST, Hanoi)***
Prof. Pham Duy Long ***(IMS, Hanoi)***

C-35
08:30 - 08:55

DESIGNING THE LONG DISTANCE - INFRARED MEASUREMENT SYSTEM

(invited talk)

Doan Giang, Nguyen Van Vinh, Nguyen Thi Phuong Mai

Hanoi University of Science and Technology, Hanoi, Vietnam

C-36
08:55 - 09:20

DESIGN LENS OBJECTIVE OF THERMAL IMAGE DEVICE

(invited talk)

Ha Nguyen Binh, Pham Hong Tuan

NACENTECH, Hanoi

C-37
09:20 - 09:35

IMPROVING THE AMMONIA SENSING OF REDUCED GRAPHENE OXIDE FILM BY USING NANOMETER METAL MATERIALS

Huynh Tran My Hoa, Hoang Thi Thu, Lam Minh Long,
Nguyen Ngoc Tham, Bui Thi Tuyet Nhung, On Thi Thanh Trang,
Nguyen Thi Phuong Thanh, Tran Quang Trung

University of Natural Science, VNU-HCMC, Hochiminh City

C-38
09:35 - 09:50

SYNTHESIS AND CHARACTERIZATION OF FLUORESCENT GOLD NANOCLUSTERS FOR BIOLOGICAL APPLIACATIONS

Thi Ha Lien Nghiem, Minh Thanh Vu and Hong Nhung Tran
Institute of Physics, VAST, Hanoi

C-39
09:50 - 10:05

TIME RESOLVED LASER ABSORPTION SPECTROSCOPY IN PULSED DISCHARGES

Nguyen Van Tan, Do Hoang Tung, Vitezslav Stranak and RainerHippler

Institute of Physics, VAST, Hanoi, Vietnam

C-40 **POLYMORPHS CHARACTERIZATION OF $BaTi_{1-x}NixO_3$, $BaTi_{1-x}Ni_xO_3$ ($0 \le x \le 0.1$)**

10:05 - 10:20

Pham Thanh Phong, Do Hung Manh, Nguyen Xuan Phuc

NhaTrang College of Education, NhaTrang, KhanhHoa

10:20 - 10:35 **Coffee break**

Chairperson:

Prof. Le Van Hong *(IMS, VAST, Hanoi)*
Dr. Vu Thi Hanh Thu (*VNU HCMC, HoChiMinh City)*

C-41 **THE RESULTS OF THE APPLICATION OF ENDOVASCULAR LASER TREATMENT OF HEADACHES AND INSOMNIA IN THAI NGUYEN**

10:35 - 11:00

(invited talk)

Bui Van Thien, Pham Cong Kiem, L. T. Nga, L. X. Thuy, Pham Van Hoi

C-42 **EFFECT OF POST-ANNEALING ON THE MEMORY WINDOW AND INTERFACE TRAP DENSITIES BETWEEN TUNNELING AND ACTIVE LAYER OF INGAZNO NONVOLATILE MEMORY DEVICE**

11:00 - 11:15

(invited talk)

Nguyen Hong Hanh, Junsin Yi

Military Academy of science and technology, Hanoi, Vietnam

C-43 **SYNTHESIS AND BIOFUNCTIONALIZATION GOLD NANOSHELLS FOR BIOMEDICAL APPLICATIONS**

11:15 - 11:30

Thi Ha Lien Nghiem, Thi Hue Do, Van Tuyen Nguyen, Thi Hai Nguyen, Duong Vu, Quang Hoa Do, Thi Thuy Duong Vu and Hong Nhung Tran

Institute of Physics, VAST, Hanoi, Vietnam

11:30 - 12:30 **POSTER II**

12:30 - 13:30 **BUFFER LUNCH**

Chairperson:

Prof. Pham Van Ben ***(VNU Hanoi, Hanoi)***
Dr. Tran Thanh Thai, (***Quy Nhon University, Binh Dinh)***

C-44
13:30 - 13:55

APPLICATION OF HIGH-POWER DIODE LASER FOR ENDOCANNALICULAR DACRYOCYSTO-RHINOSTOMY

(invited talk)

Nguyen Cong Thanh, Nguyen Thi Khanh Van, Do Hoang Tung, Dinh Viet Nghia, Le Thi Dong Phuong

Institute of Physics, VAST, Hanoi

C-45
13:55 - 14:20

FINGERPRINT DETECTION BY LASERS

(invited talk)

Bui Thi Cam Tu, Tran Hong Nghia, Le Huynh Nguyen, Nguyen Thanh Lam, Le Quynh Anh

University of Natural Science, VNU-HCMC, Hochiminh City

C-46
14:20 - 14:35

HIGH IMPEDANCE SURFACE ABSORBER FOR K BAND FREQUENCY APPLICATIONS

Cuong Tran Manh, Thuy Nguyen Thi, Cuong Vuong Van, Tuan Le Anh

Ha Noi National University of Education, Ha Noi,

C-47
14:35 - 14:50

EFFECT OF LASER ANNEALING ON PROPERTIES OF CuO NANOCRYSTALS PREPARED BY MICROWAVE IRRADIATION METHOD

Tran Thi Ha, Sai Cong Doanh, Nguyen Quang Hoa, Nguyen Viet Tuyen

VNU Ha Noi, Ha Noi, Viet Nam

C-48
14:50 - 15:05

FORSTER RESONANCE ENERGY TRANSFER (FRET) WITH A METAL NANOPARTICLE AND SURFACE PLASMON ENERGY TRANSFER (SET) MECHANISM

Tran Van Thien, Nguyen Minh Hoa, Bui Thi Le Quyen, Le Van Xuan, Chu Viet Ha, Do Thi Nga, Nguyen Ai Viet

Hue Medical and Pharmacy University, Hue, Vietnam

C-49 **15:05 - 15:20**

USAGE OF SOLID SATE SATURABLE ABSORBER Cr^{4+}:YAG IN PASSIVELY Q-SWITCHING MONOPULSED Nd:YAG LASER,

Nguyen Van Binh, Nguyen Quang Minh, Ta Van Tuan

Center for System Engineering and Integration (SCEI), Hanoi

15:20 - 15:35 **Coffee break**

PLENARY SESSION

(Conference Hall: 713)

Chairperson

Prof. Vu Xuan Quang (*Duy Tan University, VietNam*)

Prof. Nguyen Dai Hung (*IOP, VAST, VietNam*)

PL-06 **15:25-16:00**

RESEARCH PROGRESS OF THE UNIVERSITY OF ELECTRO-COMMUNICATIONS, TOKYO, JAPAN

Wataru Mitsuhashi and Masayuki Katsuragawa

*The University of Electro-Communications, Tokyo, Japan***.**

PL-07 **16:00-16:35**

INTRODUCTION TO DUY TAN UNIVERSITY

Le Cong Co

Duy Tan University, Da Nang

16:35 **CLOSING REMARK**

POSTER I

Chairperson:

Prof. Tran Hong Nhung (*IOP, VAST, Hanoi)*
Prof. Le Vu Tuan Hung *(VNU-HCMC, Ho Chi Minh City)*
Dr. Nguyen Huy Bang *(Vinh University, Nghe An)*
Dr. Tran Thanh Thai (*QuyNhon University, Binh Dinh)*

PI-01. **EFFECT OF MORPHOLOGY OF TWO-LAYERED NANOPARTICLES ON THEIR OPTICAL PROPERTIES**

L.G. Astafyeva, G.P. Ledneva, Pham Hong Minh

B.I.Stepanov Institute of Physics, NASB, Minsk, Belarus

PI-02. **IDENTIFICATION OF MATURED WINE DISTILLATES BY MEANS OF PCA, LDA/QDA, CLASSIFICATION TREES AND PLS1 APPLIED TO UV-VIS-NIR TRANSMISSION SPECTRA**

M.V.Rogovaya, G.V.Sinitsyn, E.A.Skorbanova, M.A.Khodasevich N.F. Degtyar, E.I.Nezalzova

B.I.Stepanov Institute of Physics, NASB, Minsk, Belarus

PI-03. **AEROSOL CONTENT IN ATMOSPHERE BY DATA OF REMOTE GROUND-BASED AND SATELLITE MEASUREMENTS AND MODELLING**

Vitaly Kabashnikov, Natallia Miatselskaya, Anatoli Chaikovsky,
Nguyen Thanh Binh, Nguyen Dai Hung, Vu Thi Bich, Dinh Van Trung

B.I.Stepanov Institute of Physics, NASB, Minsk, Belarus

PI-04. **STIMULATED RAMAN SCATTERING OF PICOSECOND LASER RADIATION IN LIGHT AND HEAVY WATER**

A.I. Vodchits, V.A. Orlovich, V.S. Gorelik, Y.P. Voinov

B.I.Stepanov Institute of Physics, NASB, Minsk, Belarus

PI-05. **Z-SCAN STUDIES OF VANADATES CRYSTALS AT 532 nm**

A.I. Vodchits, V.A. Orlovich, P.A. Apanasevich

B.I.Stepanov Institute of Physics, NASB, Minsk, Belarus

PI-06. **SENSITIVITY OF FLUORESCENCE-INTENSITY RATIO TEMPERATURE MEASUREMENT IN ER-DOPED CRYSTALS AND NANO-GLASS-CERAMICS**

V. A. Aseev, M. A. Khodasevich, G. V.Sinitsyn, Y. Varaksa

B.I. Stepanov Institute of Physics, NASB, Minsk, Belarus

PI-07. **OPTO - ACOUSTIC METHOD OF INCREASING THE EFFICIENCY OF PHOTODYNAMIC THERAPY OF SOLID TUMORS**

M.M. Asimov, R.M. Asimov, Nguyen Cong Thanh, N. Thi Khanh Van

B.I.Stepanov Institute of Physics, NASB, Minsk, Belarus

PI-08. **RESIDUAL RARE-EARTH IONS AS AN ORIGIN OF UP-CONVERSION PROCESSES IN KGW CRYSTAL AT THE DIODE LASER PUMPING**

I.A. Khodasevich, A.S. Grabtchikov, A.A. Kornienko, E.B. Dunina,
Do Quoc Khanh, Nguyen Dai Hung

B.I.Stepanov Institute of Physics, NASB, Minsk, Belarus

PI-09. **GROWTH AND RAMAN SPECTRA OF $Ca_{10}ME(VO_4)_7$(ME = Li, Na, K) CRYSTALS**

I.A. Khodasevich, N.N. Shereshovets, S.V. Voitikov, and V.A. Orlovich,
M.B.Kosmyna, B.P.Nazarenko, V.M.Puzikov, A.N. Shekhovtsov

B.I.Stepanov Institute of Physics, NASB, Minsk, Belarus

PI-10. **ANTI-STOKES AND STOKES PULSE GENERATION IN RAMAN MICROCHIP LASER: EXPERIMENT AND MODELING**

S.V. Voitikov, A.A. Demidovich, M.B. Danailov, N.D. Hung and V.A. Orlovich

B.I.Stepanov Institute of Physics, NASB, Minsk, Belarus

PI-11. **PHOTOINACTIVATION OF BACTERIAL CELLS BY OPTICAL RADIATION OF VISIBLE SPECTRAL REGION**

A.V. Mikulich, A.I. Tretyakova, L.G. Plavskaya, N.N. Pivankova, N.A. Yudina, V.Yu. Plavskii

B.I.Stepanov Institute of Physics, NASB, Minsk, Belarus

PI-12. **PHOSPHORESCENCE OF BILIRUBIN**

V.Yu. Plavskii, V.N. Knyukshto, A.I. Tretyakova, A.V. Mikulich, L.G. Plavskaya, I.A. Leusenko, B.M. Dzhagarov

B.I.Stepanov Institute of Physics, NASB, Minsk, Belarus

PI-13. **REGULATORY BIOLOGICAL ACTION OF CONTINUOUS, QUASI-CONTINUOUS AND PULSED LASER RADIATION OF NANO- AND PICOSECOND RANGES**

V.Yu. Plavskii, N.V. Barulin, A.I. Vodchits, I.A. Khadasevich, L.E. Batay,
A.S. Grabchikov, A.I. Tretyakova, L.G. Plavskaya, A.V. Mikulich, V.A. Orlovich

B.I.Stepanov Institute of Physics, NASB, Minsk, Belarus

PI-14. **FLUORESCENCE OF BILIRUBIN AT ROOM TEMPERATURE AND TEMPERATURE OF LIQUID NITROGEN**

A. I. Tretyakova, P. P. Pershukevich, V. N. Knyukshto, A. V. Mikulich, L. G. Plavskaya, A. N. Sobchuk, V. Yu. Plavskii

B.I.Stepanov Institute of Physics, NASB, Minsk, Belarus

PI-15. **DETERMINATION OF HEAVY METALS BY SURFACE – ENHANCED RAMAN SCATTERING: A CASE OF ANTIMONY DETECTION**

A. Yu. Panarin, I. A. Khodasevich, S. N. Terekhov

B.I.Stepanov Institute of Physics, NASB, Minsk, Belarus

PI-16. **INVESTIGATION OF RAMAN SPECTRA AND OPTICAL DENSITY OF BLOOD AT CYCLOCITIDINE AND LASER IRRADIATION INFLUENCE ON TUMOR PROCESS**

L. E. Batay, I. A. Khodasevich, M. A. Khodasevich, E.Yu. Manina, T.E. Kuznetsova, N. B. Gorbunova

B.I.Stepanov Institute of Physics, NASB, Minsk, Belarus

PI-17. **PROBING THE SURFACE-ENHANCED RAMAN SCATTERING PROPERTIES OF THE NOBLE METAL NANOPARTICLES SYNTHESIZED USING BIOPOLYMER PECTIN**

A.Yu. Panarin, Y.L. Balachandran, I.A. Khodasevich, S.N. Terekhov, A.C. Gutleb, S. Girija

B.I.Stepanov Institute of Physics, NASB, Minsk, Belarus

PI-18. **ENTROPIC MEASURE OF DISORDER FOR THE SYSTEM OF TWO-LEVEL ATOMS PLACED IN TWO-DIMENSIONAL CAVITY**

Nguyen Thanh Vinh, Bui Dinh Thuan, Cao Long Van, Wiesław Leoński

Institute of Physics, University of Zielona Góra, Zielona Góra, Poland

PI-19. **TEMPERATURE AND EXCITATION POWER – DEPENDENCE OFPHOTOLUMINESCENCE SPECTRA IN GaAs/Al_XGa_{1-X} AS ASYMMETRIC DOUBLE QUANTUM WELLS**

Alexander De Los Reyes, Rafael Jaculbia, Jessica Afalla. Joselito Muldera, Kaye Anne de las Alas, John Daniel Vasquez, Sheryl Vizcara, Elmer Estacio, Armando Somintac and Arnel Salvador

University of the Philippines – Diliman, Quezon City, Philippines

PI-20. **PHOTOLUMINESCENCE AND ELECTRON MICROSCOPY STUDY OF PbS NANOPARTICLES PREPARED BY THE LASER ABLATION AND PERSPECTIVES FOR PHOTONIC APPLICATIONS**

Zdenek Remes, Konstantin Zhuravlev, Tomas Novak, Vladislav Drinek, Radek Fajgar, The Ha Stuchliková, Jiri Stuchlik

Institute of Physics ASCR, Praha, Czech Republic

PI-21. **KINETICS OF PHOTOLUMINESCENCE FROM CDS NANOCRYSTALS FORMED BY LANGMUIR-BLODGETT TECHNIQUE**

A.A. Zarubanov and K.S. Zhuravlev

Rzhanov Institute of Semiconductor Physics, Novosibirsk, Russia

PI-22. **EFFECT OF THE POLARIZATION CHARGES AT THE INTERFACES OF THE $Al_xGa_{1-x}N$/GaN QUANTUM WELLS ON THE OPTICAL ABSORPTION**

Nguyen Thanh Tien, Pham Thi Bich Thao, Pham Thi Thuy Oanh

College of Natural Science, Can Tho University, Can Tho City

PI-23. **OPTICAL PROPERTIES OF MATERIALS: TWO DIFFERENT CALCULATING APPROACHES**

Dinh Son Thach, Dinh Nguyen Trong Nghia, Nguyen Khanh My, Chau Tuan Khanh

Ho Chi Minh City University of Food Industry, Ho Chi Minh City

PI-24. **MULTIPLE ACOUSTIC PLASMONS IN OPTICALLY EXCITED SEMICONDUCTORS**

Dinh Nguyen Trong Nghia, Vu Quang Tuyen

Ho Chi Minh City University of Food Industry, Ho Chi Minh City

PI-25. **IMPROVING EFFICIENCY OF SECOND-HARMONIC GENERATION WITH FEMTOSECOND Ti:SAPPHIRE LASER PULSES**

Huynh Ngoc Linh Phuong, Bui Yen Duy, Le Cong Nhan

Sai Gon University, Ho Chi Minh city, Viet Nam

PI-26. **ADDITIONNAL INFORMATION TO OPTICAL SPECTROSCOPIC DATA ON CANCER RESEARCHES WITH NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY**

Vu Thi Kim Ngoc, V H Thai, L T Tu, P T Hai

Center of Analytical Services and Experimentations (CASE) HCMC

PI-27. **AUTOFLUORESCENT OF LIVER TISSUE OF CANCER PATIENT**

Nguyen Thi Khanh Van, Nguyen Dinh Hoang, Nguyen Thanh Binh,
Nguyen Cong Thanh and Pham Kim Binh

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

PI-28. **AB-INITIO STUDY ON POINT DEFECT IN Al-, Ta-, AND Zn- DOPED SnO_2**

Nguyen Si Hoai Vu, Dang Huu Duc, Tran Tuan and Le Tran

University of Natural Science - VNU HCMC, Hochiminh City

PI-29. **OPTICAL PROPERTIES OF ZINC OXIDE QUANTUM DOTS FABRICATER BY SOLGEL METHOD WITH IN-SOLUTION ANNEALING**

Thach Dinh Son, Hang Bui Thi Thu, HuyThi Quoc, Dinh Pham Hai,
Hien Nguyen Van, Quang Tran Ngoc

University of Natural Science - VNU HCMC, Hochiminh City

PI-30. **PHOTOLUMINESCENCE PROPERTIES OF ZnO THIN FILM GROWTH BY ELECTROCHEMICAL METHOD ON MONOLAYER GRAPHENE SHEET**

Pham Minh Thong, Nguyen Quang Khoi, Dinh Son Thach

University of Natural Science - VNU HCMC, Hochiminh City

PI-31. **CONTROLLING GROUP VELOCITY OF LIGHT IN A FIVE-LEVEL CASCADE EIT MEDIUM**

Nguyen Tuan Anh, Le Van Doai, Dinh Xuan Khoa, and Nguyen Huy Bang

Vinh University, Vinh city, Vietnam

PI-32. **SURFACE-ENHANCED RAMAN SCATTERING NANOPROBES FOR DETECTION OF MELAMINE**

Nguyen Thi Thai An, Nguyen Thi Thuy, Tran Anh Duc,
Young-Ill Lee and Tran Hong Nhung

Duy Tan University, VietNam

PI-33. **JUDD – OFELT ANALYSIS OF SPECTROSCOPIC PROPERTIES OF Sm^{3+} IONS IN K_2GdF_5 SINGLE CRYSTAL**

Phan Van Do, Vu Phi Tuyen, Vu Xuan Quang, Nguyen Trong Thanh,
Vu Thi Thai Ha, N. M. Khaidukov

Water resources University, Hanoi, VietNam.

PI-34. **EFFECT OF TECHNOLOGICAL CONDITIONS ON OPTICAL PROPERTIES OF ZnO-SiO_2 NANOCOMPOSITES DOPED WITH Eu^{3+} IONS**

Pham Son Tung, Tran Ngoc Khiem, Ngo Ngoc Ha, Le Thi Thu Hien

ITIMS, HUST, Hanoi, Vietnam

PI-35. **DETERMINATION OF PESTICIDES IN SOLUTIONS USING NANO POROUS SILICON MICROCAVITY SENSORS**

Nguyen Thuy Van, Nguyen The Anh, Tran Thi Cham, Nguyen Hai Binh, Bui Huy, Tran Dai Lam and Pham Van Hoi

Institute of Materials Science, VAST, Hanoi

PI-36. **A STUDY ON OPTICAL FILTERS USING TWO DIMENSIONAL PHOTONIC CRYSTALS**

Hoang Thu Trang, Man Hoai Nam, and Ngo Quang Minh

Institute of Materials Science, VAST, Hanoi

PI-37. **THE STUDY OF FIBER BRAGG GRATING SENSOR BASED ON SELF-MIXING INTERFEROMETRY FOR STATIC STRAIN MEASUREMENT**

Pham Thanh Binh, Nguyen The Anh, Nguyen Thuy Van, Nguyen Ngoc Linh, Bui Huy, Han Cheng Seat, Pham Van Hoi

Institute of Materials Science, VAST, Hanoi

PI-38. **RELAXATION DYNAMICS FEATURES OF ELECTRONIC EXCITATION OF GOLD NANOPARTICLE-LIGAND CONJUGATES**

S. A. Tikhomirov, O. V. Buganov, A. N. Ponyavina, T. H. L. Nghiem, H. T. Do, D. H. Nguyen

B. I. Stepanov Institute of Physics NASB, Minsk, Belarus

PI-39. **PHOTOLUMINESCENCE OF SILICON NANOPARTICLES PREPARED BY PULSED LASER ABLATION**

Chu Anh Tuan, Nguyen Thi Thu Trang, Le Anh Tu, Duong Thi Giang, Pham Hong Duong, Pham Thanh Huy

Institute of Materials Science, VAST, Hanoi

PI-40. **SYNTHESIS AND CHARACTERIZATION OF THE ORGANIC-INORGANIC HYBRID MATERIALS FOR FABRICATION OF PHOTONIC CRYSTAL**

Nguyen Thanh Huong, Nguyen Manh Hung, Hoang Thi Khuyen, Tong Quang Cong and Vu Doan Mien

Institute of Materials Science, VAST, Hanoi

PI-41. **SYNTHESIS AND LUMINESCENCE PROPERTIES OF Tb^{3+} IONS CONTAINED NANORODS BY A SOFT TEMPLATE - ASSISTED HYDROTHERMAL ROUTE**

Tran Thu Huong, Le Thi Vinh, Ha Thi Phuong, Hoang Thi Khuyen,
Nguyen Thanh Huong, Tran Kim Anh and Le Quoc Minh

Institute of Materials Science, VAST, Hanoi

PI-42. **DYNAMICAL INTERACTION OF WHISPERING GALLARY MODE EVANESCENCE WAVE AND SILICA HALF TAPER FIBER TIP**

Le Huu Thang, Dinh Van Trung, Nguyen The Anh, N. T. Van, Pham Van Hoi

SMEDEC1, STAMEQ., Hanoi, Vietnam.

PI-43. **AEROSOL DISTRIBUTION OF ASEAN AREA BASE ON LIDAR MONITORING DATA AT HANOI AND TRAJECTORY STATISTICS SIMULATION**

Nguyen Thanh Binh, Nguyen Dinh Hoang, Nguyen Xuan Tuan, Bui Van Hai, Dinh Van Trung, Vitali Kabashnikov

Institute of Physics, Vietnam Academy of Science and Technology

PI-44. **NONLINEAR OPTICAL EFFECT IN KGW CRYSTAL AT CONTINUOUS-WAVE EXCITATION DUE TO RESIDUAL RARE-EARTH IONS**

I.A. Khodasevich, A.S. Grabtchikov, A.A. Kornienko, E.B. Dunina,
Do Quoc Khanh, Nguyen Dai Hung

Institute of Physics, VAST, Hanoi

PI-45. **DEVELOPMENT OF A FLUORESCENCE MICROSCOPE USING TOTAL INTERNAL REFLECTION EFFECT (TIRFM)**

Vu Minh Thanh, Nguyen Dinh Hoang, Vu Duong

Institute of Physics, VAST, Hanoi

PI-46 **A MONTE CARLO APPROACH TO EVELUATION OF EFFECTIVE EMISSIVITY OF A CYLINDER-INNER-CONE CAVITY**

Nguyen Quang Minh , Nguyen Ba Thi, Nguyen Van Binh,

NACENTECH, Hanoi, Vietnam

PI-47 **REASEARCH IN APPLICATION OF LOW POWER SEMICONDUCTOR LASER IN TREATMENT TO REHABILITATE VARICOSE VEINS IN LEGS**

Tran Minh Thai, Can Van Be, Ngo Thi Thien Hoa, Tran Thien Hau, Bui Van Minh,

Trinh Tran Hong Duyen, Phan Van ToNi, Nguyen Duong Hung,
Nguyen Dinh Quang, N. M. Chau, T. A. Tu, N. Thi Huong Linh
University of Technology – VNU HCMC, Ho Chi Minh City

PI-48 **EFFECT OF HYDROGENE PLASMA TREATMENT ON EFFECTCIENCY OF SILICON HETEROJUNCTION SOLAR CELLS WITH ZnO:Al TRANSPARENT CONDUCTIVE OXIDE**

Pham Hoai Phuong, Pham Dang Khoa, Pham Kien Trung, Tran Trong Nhan,
Tran Quang Trung
University of Science – VNU HCMC, Ho Chi Minh City

PI-49. **DETECTION AND LOCALIZATION TENDONS OF HUMAN HAND USING NEAR INFRARED IMAGING**

T.V. Tien, P.T. Dung, V.H.B. Khanh, P.T.H. Mien and H.Q. Linh
University of Technology – VNU HCM, Ho Chi Minh City

PI-50. **DESIGN AND MANUFACTURE A PROGRAMABLE MECHANICAL SYSTEM SCANNING TWO DIMENSIONS AND APPLIED REMOTE SENSING**

Nguyen Dinh Hoang, Bui Van Hai, Nguyen Thanh Binh, Dinh Van Trung
Institute of Physics, VAST, Hanoi

PI-51. **CHEMICAL TRANSFORMATION FABRICATION FROM ONE DIMENTIONAL NANOMATERIALS $Y(OH)_3:Er^{3+}$, Yb^{3+} TO $NaYF_4:Er^{3+}$, Yb^{3+} AND THEIR UPCONVERSION LUMINESCENCE PROPERTIES**

Lam Thi Kieu Giang, Nguyen Thanh Huong, Nguyen Thanh Binh,
Tran Kim Anh and Le Quoc Minh
Institute of Materials Science, VAST., Hanoi, Vietnam.

PI-52. **PREPARATION OF FLUORESCENT POLYMER MICROSPHERES**

Anh Duc Tran, Duong Vu, Thi Ha Lien Nghiem
Institute of Physics, VAST , 10 Dao Tan, Ba Dinh, Hanoi

PI-53. **SINGLE-PULSE SUPER CONTINUUM GENERATION IN PHOTONIC CRYSTAL FIBERS**

Le Cong Nhan
Sai Gon University, Ho Chi Minh city, Viet Nam

PI-54. **MICROWAVE-ASSISTED SYNTHESIS OF VISIBLE-LIGHT-INDUCED Bi_2WO_6 PHOTOCATALYSTS**

N. Thi Thu Huyen, N. Thi Thu Hien, N. Dang Phu, and Luc Huy Hoang

Hanoi National University of Education, Hanoi

PI-55. **TREATMENT OF INFLAMATION AND RHEUMATHISM BY USING LASER DIODE THERAPY EQUIPMENT**

Nguyen Trong Luu, Vu Doan Mien, Tran Minh Van, Nguyen Van Hieu,
Tran Quoc Tien, Pham Van Truong

Central Military Hospital 108, Hanoi

PI-56. **USING LASER DIODE THERAPY EQUIPMENT TO TREAT BURNS AND WOUNDSOF RABBITS**

Nguyen Manh Hung, Vu Doan Mien, Tran Minh Van, Nguyen Van Hieu,
Tran Quoc Tien, Pham Van Truong

Institute of Materials Science, VAST, Hanoi

PI-57. **PHOTOLUMINESCENCE LIFETIMES IN NIR – AN AFFORDABLE QUANTAMASTER OPTION**

Alex Siemiarczuk, Wei Zhang and Ramdane Benferhat

Fast Kinetics Application Laboratory, HORIBA-PTI Canada

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PGS. Vu Thi Bich *(IOP, VAST, Hanoi)*
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Pham Minh Tien, Nguyen Dinh Hoang, Do Quang Hoa and Dinh Van Trung

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Giang Manh Khoi, Nguyen Quyet Thang, Trinh Dinh Chien

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ABSTRACT

PL - 01

ULTRAFAST STRUCTURAL DEFORMATION OF MOLECULES BY COINCIDENCE MOMENTUM IMAGING AND LASER ASSISTED ELECTRON DIFFRACTION

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Abstract.

It has been known that geometrical structure of molecules is deformed largely within a very short period of time when they are exposed to an intense laser field. Among such ultrafast processes, ultrafast hydrogen migration is noteworthy. A series of our recent studies [1-3] showed that the migration of a hydrogen atom or a proton within a hydrocarbon molecule can proceed within the duration of an ultrashort excitation laser pulse. In order to probe the ultrafast hydrogen migration processes within CH_3OH in real time, we performed pump-probe coincidence momentum imaging measurements by using few-cycle laser pulses, and revealed that the hydrogen migration in the singly charged manifold, $CH_3OH^+ \rightarrow CH_2OH_2^+$, starts to proceed within the pump-probe delay time shorter than 20 fs. In the present talk, after the recent experimental results are introduced, possible mechanisms of this extremely fast hydrogen migration will be discussed based on theoretical wave packet simulations of the hydrogen migration on the potential energy surfaces of CH_3OH^+. For probing ultrafast structural deformation of molecules, we developed another technique called laser assisted electron diffraction (LAED) [4, 5] by which ultrafast deformation of the geometrical structure of molecules can be probed in real time as a series of snapshots of electron diffraction patterns. The temporal resolution of this optical gating method can in principle be as short as the temporal duration of ultrashort laser pulses employed in the pump-probe measurements. In the present talk, on the basis of the LAED patterns of CCl_4 that we recently recorded, future applications of this LAED method for determining instantaneous geometrical structures of molecules will be discussed.

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PL - 02

NANOPHOTONIC STRUCTURES FOR IMPROVING THE PERFORMANCE OF OPTICAL DEVICES

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Abstract.

Recently, bioinspired nanophotonic structures including subwavelength structures (SWSs) and compound eye structures (CESs), which demonstrate outstanding antireflection properties over wide range of wavelengths and angles, have attracted great attention for improving the performance of optical and optoelectronics devices, such as solar cells, photodetectors, light emitting diodes (LEDs), and glasses/polymers by reducing the undesirable reflection between difference optical media.

Herein, we report high-performance solar cells, LEDs, and transparent glasses/polymers with biomimetic SWSs and CESs [1-7]. Prior to fabrication of the antireflective SWSs and CESs, theoretical investigation based on optical modeling was carried out to determine desirable geometric structures (i.e., shape, period, height, and fill fraction) for each device. To produce the SWSs and CESs using simple and cost-effective method, various nanofabrication techniques were developed. Compound semiconductor material-based and silicon-based solar cells showed enhanced power conversion efficiency in wide incident angles by integrating the SWSs compared to the cell with flat surface. Red and blue LEDs with SWSs and CESs also showed much enhanced light extraction efficiency compared to that of without the nanophotonic structures. The optical transmittance of glasses and polymers was also enhanced by employing antireflective SWSs. Hence, the biomimetic SWSs and CESs hold great potential for improving performance of various optical and optoelectronic devices.

Acknowledgement

This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MEST) (No. 2011-0017606).

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PL - 03

ENHANCEMENT OF LASING EMISSION IN THE METALLIC-COATED MICROSPHERE CAVITY BASED ON Er-DOPED SILICA GLASSES

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Abstract.

In a recent report, we demonstrated abnormal upconversion green light emission from erbium ions doped in silica with narrow linewidth in the weak-confining cavity. Here we present the experimental results of enhancement and wavelength shift of narrow linewidth upconversion emission at 537 nm-wavelength from erbium ions in the noble metallic (Pt, Au)-coated microsphere cavity. The reason of this phenomenon explains by the atom-photon interaction in the cavity assisted by surface plasmon-coupled emission.

PL - 04

ATTRACTIVE NATURES IN A SET OF A HIGHLY-DISCRETE COHERENT SPECTRUM

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Abstract.

We discuss on a very simple and attractive technique on manipulations of a highly-discrete coherent spectrum which in general can be generated with the adiabatic driving of a Raman coherence. A train of transform-limited attosecond pulses is produced by simply inserting transparent materials. Other various examples related with this technique will be also shown.

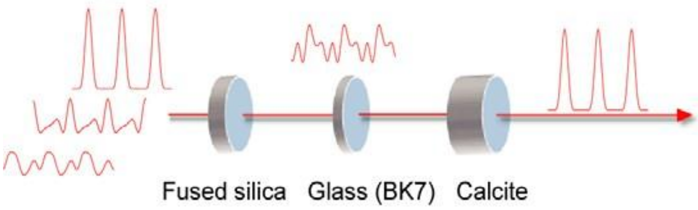

Fig. 1. *Conceptual illustration of the novel method for generation of a train of attosecond pulses.*

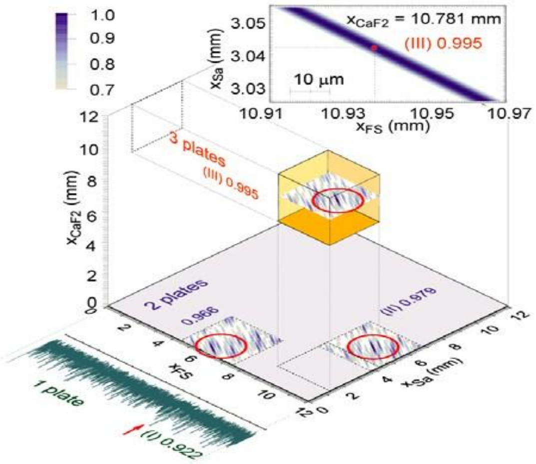

Fig. 2. *Exploration of optimum solutions using the method shown in Fig. 1. Peak variation in the intensity waveforms are illustrated as a function of the thickness of the inserted transparent plates for the three cases of (I) one plate, (II) two plates, and (III) three plates.*

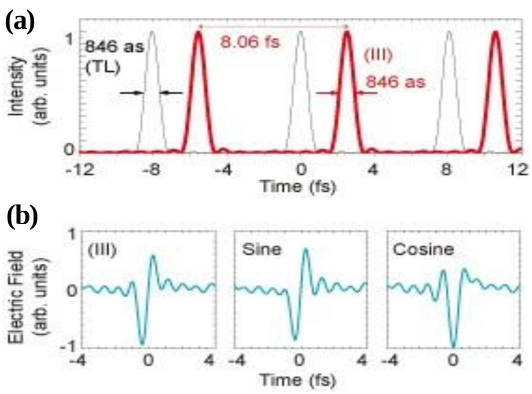

Fig. 3. *(a) The temporal intensity waveform (thick line) achieved at the condition (III) in Fig. 2. (b) Manipulation of the electrical amplitude waveforms around the condition (III).*

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PL - 05

$Eu:KGd(WO_4)_2$: NOVEL LASER AND NONLINEAR CRYSTAL

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Abstract.

Monoclinic double tungstates, $KE(WO_4)_2$ (with RE = Gd, Y or Lu) doped with rare-earth ions are well-known materials for high-efficient near-IR lasers. In the present paper, we report on our recent achievements in extension of this crystal family by europium doping in order to produce visible lasers. For this, intense red emission of Eu^{3+} related with ${}^5D_0 \rightarrow {}^7F_J$ transitions is utilized.

Eu:double tungstates were grown by TSSG method under low thermal gradients (from the flux), the content of Eu^{3+} ions was 2, 10, 25 at.%. Absorption and stimulated-emission cross-section spectra were evaluated for these crystals for principal light polarizations, $E||N_p$, N_m and Ng (Fig. 1). Double tungstates show profound anisotropy of spectroscopic properties; with m-polarization being most preferable both for pumping and laser action due to highest σ_{abs} and σ_{se}.

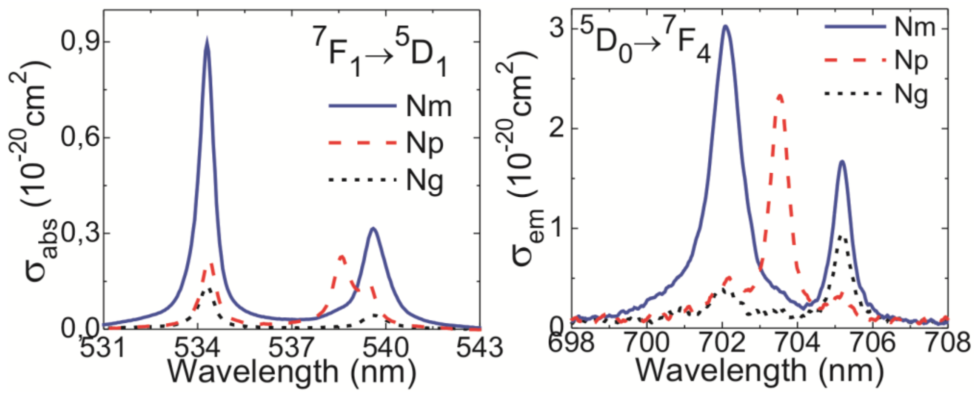

Fig.1. *Absorption and stimulated-emission cross-section spectra for Eu^{3+}: $KGd(WO_4)_2$ crystal for principal light polarizations.*

Eu double tungstate were pumped at 533.6 nm (${}^7F_1 \rightarrow {}^5D_1$) by frequency-doubled $Nd:KGd(WO_4)_2$ laser. To obtain free-running generation a flash-lamp pump was used. To realize quasi-CW and CW generation the $Nd:KGd(WO_4)_2$ laser was pumped by a laser diode.

In the free-running mode, 420 µJ pulses with duration of 15 µs were obtained (Fig. 2). Introduction of saturable absorbent based on liquid dye allows us to observe Q-switched operation with pulse duration of 34 ns and associated self-Raman conversion to light wavelength of 750 nm (1st Stokes).

In the quasi-CW mode, 55 mW of output peak power was obtained with TOC = 2% (incident one was 1.5 W). Realization of real-CW yielded 6 mW of red output. The quasi-CW and CW $Eu:KGd(WO_4)_2$ laser emitted the nearly Gaussion circular beam. The laser thershold was less then 1 kW/cm^2.

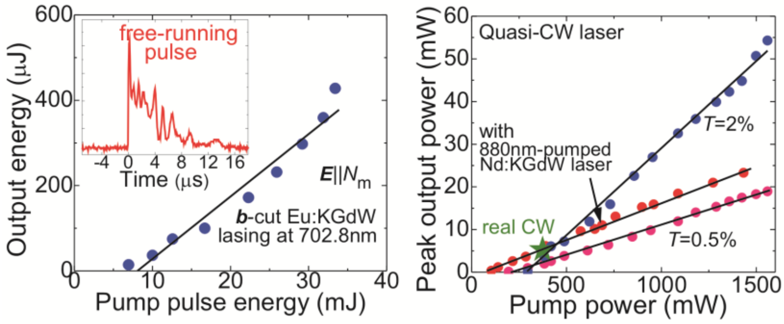

Fig. 2. *Output-inpur dependencies for free-running pulsed (left graph) and quasi-CW (right graph) Eu:KGd(WO$_4$)$_2$ lasers.*

From the first exsperimental results we can conclude that Eu:KGd(WO$_4$)$_2$ is promissing crystal for pulsed, quasi-CW and CW laser operation at ~ 703 nm intracavity Raman conversion in ~ 750 nm spectral range.

PL-06

RESEARCH PROGRESS OF THE UNIVERSITY OF ELECTRO-COMMUNICATIONS, TOKYO, JAPAN

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Abstract.

In the last decade, the total number of research “output” from Japan – mostly journal or conference papers in the main fields of science and technologies -- decreased gradually but definitely. In order to countermeasure this situation, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) Japan started the Program for Promoting the Enhancement of Research Universities, and selected 22 institutions in August 2013. The University of Electro-Communications (UEC) in Tokyo was selected as an institution to receive support under this program as a result of its strengths in three main areas: optics and photonics research, computer science, and robotics.[1] The UEC Tokyo is a small, luminous university at the forefront of applied sciences, engineering, and technology research. Its roots go back to the Technical Institute for Wireless Communications, which was established in 1918 as a vocational training institute for training engineers of maritime radio communications in response to the Titanic disaster in 1912. In 1949, the UEC Tokyo was established as a national university by MEXT Japan. With approximately 4,000 students and 350 faculty in 8 departments of 2 graduate courses, The UEC Tokyo is even now regarded as a small university, but with particular expertise in information and communication engineering, laser science, robotics, informatics, and material science, *etc*.

In this talk, we will give an overview of the recent progress in research activity of the UEC Tokyo.

PL-07

INTRODUCTION TO DUY TAN UNIVERSITY

Le Cong Co

Duy Tan University, Da Nang

A - 01

HIGH RESOLUTION TABLE-TOP COHERENT DIFFRACTIVE IMAGING WITH AN EXTREME ULTRAVIOLET SOURCE

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Abstract.

When an object is exposed to coherent light, the diffraction pattern of the object is recorded and the object's image may be reconstructed with high spatial resolution that is limited only by the wavelength of the incident light. However, this requires a very bright coherent source. At present the availability of a bright coherent source of X-rays and soft X-rays, which in many coherent diffractive imaging (CDI) experiments is provided by a synchrotron or a free-electron laser, is a bottleneck in the development and application of diffraction microscopy. Here, we report an extreme ultraviolet CDI transmission microscope which utilizes a small-scale table-top femtosecond laser. Using a focussed narrow-bandwidth high harmonic generation (HHG) source with wavelength around 30 nm we achieve a resolution of ~ 45 nm with a sample size down to 3 μm x 3 μm in a short exposure time of < 5 s. The ratio of beam size to sample size needs to be considered in order to achieve a high-quality reconstruction of the image, where a plane wave-field and a small additional constant phase are used in the reconstruction. This new experimental scheme is very promising for imaging sub-10 nm scale objects with an inexpensive table-top, commercially available femtosecond laser system.

Keywords: *coherent diffraction imaging, high harmonic generation, laser applications*.

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A - 02

PRESENT STATUS OF GEKKO-EXA PROJECT OF ILE, OSAKA UNIVERSITY

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Abstract.

The institute of laser engineering, Osaka University (ILE) is an only joint user's facility with large lasers in Japan. (http://www.ile.osaka-u.ac.jp/en/index.html) Nano-second kJ pulses in the wavelength of 1.053 mm and its second and third harmonics are provided from the GEKKO-XII laser system, which is also utilized for international collaborative researches in the various fields, such as high pressure material science, laboratory astrophysics, planetary science and many plasma sciences including the inertial confinement fusion as was founded for. Although the system is sill quite useful with successive improvement, especially with the recent construction of the world-class ultra high power laser "LFEX", it is already 29 years old. We proposed an construction of a new high energy laser system called "GEKKO-EXA"[1] in order to launch into a new field of high field science based on our recent development in the high power laser technology. The GEKKO-EXA project has been revised depending on the domestic user's demand. Here presented is a revised proposal for the GEKKO-EXA project. The project is aiming at the investigation of the physics under the intense laser field up to 10^{24} W/cm^2. Some of the preliminary computational simulation for the future experiment and relevant experimental study will be also reported.

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A - 03

COHERENT π-ELECTRON ROTATIONS IN A NONPLANAR CHIRAL AROMATIC MOLECULE

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Abstract.

The π electrons in aromatic rings are considered to play an important role for organic electronics. Research on electrodynamics in molecular systems have been accelerated by recent developements of laser technology. There have also been theoretical studies of π-electron dynamics control in aromatic ring molecules by UV laser pulses[1-14].

The π-electron ring current in Mg-porphyrin are induced by a few cycle of circularly polarized (CP) UV laser pulse[3-5]. Here photon angular momentum is transfered to degenerated electronic excited states by circularly polarized laser pulse. The lineraly polarized (LP) UV laser pulse is also used to create π-electron ring current in 2,5-dichloro[n](3,6) pyrazinophane[6-9], which is a chiral molecule and has no degenerate electronic excited states. The π-electron ring currents are created by coherent excitation of a pair of quasi-degenerate electronic excited states.

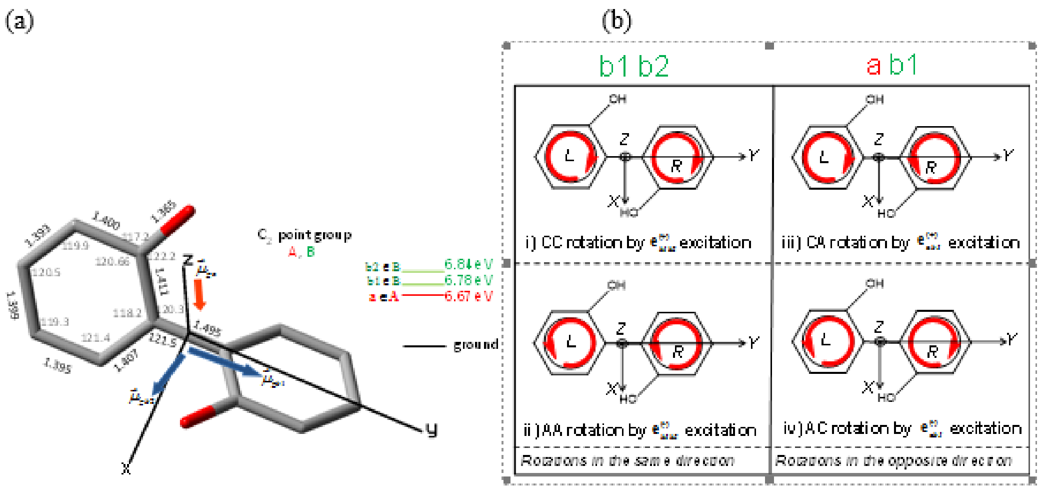

***Fig. 1**. (a) Geometrical structure of (P)-2,2'-biphenol and transition dipole moments with three electronic excited states a, b1 and b2. (b) Four patterns of ring current rotations induced by coherent excited states $(b_1 \pm b_2)$ and $(a \pm b_1)$. Here + (-) represents a polarization direction of laser pulse which creates a combination of two coherent excited states with in-phase (out-phase).*

In this work we use (*P*)-2,2'-biphenol, which is a typical nonplanar chiral aromatic molecule with axial chirality (see Fig.1a). Figure 1b shows that there are four possible rotational paterns (CC, AA, CA and AC) where C and A refer to clockwise and anticlockwise rotations respectively, and the first and second letters in each patterns refer to left (*L*) and right (*R*) phenol rings respectively. The left (right) hand side of Fig. 1b represents the initial rotational direction of π electrons in the case in which a superposition of two electronic excited states *b1* and *b2* (*a* and *b1*), with same (different) irreducible representation of point group C_2 is prepared. The directions of the laser pulse polarizations $\mathbf{e}_{\alpha\beta}^{(+)}$ ($\mathbf{e}_{\alpha\beta}^{(-)}$) represents initial preparation of the relative phase between α and β is in-phase (out-phase). Based on these rotational patterns we clarify how the ring currents and bridge current are created, and show time dependent behaviors of them[10-14].

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A - 04

SCALABLE AND LOW COST THZ FILTER BASED ON U – SHAPED ARRAY FABRICATED VIA CONVENTIONAL PHOTOLITHOGRAPY UTILIZING PHOTOMASK PRINTED USING A COMMERCIAL PRINTER

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Abstract.

In this work, a proof-of-concept demonstration of filters operating in the THz region, is presented. Based on FDTD simulations, we designed a low-cost fabrication of THz filters based on U – shaped arrays. The fabrication was done using conventional photolithography with a photomask printed on a transparency film using a commercially-available printer. This technique allows for fast and costeffective fabrication. By varying the side length and linewidth of the U – shaped arrays, frequency tunability was achieved. The experimental and simulated THz spectra were compared and discrepancies from the simulations were observed. These can be attributed to the structural disorder on the U – shaped arrays due to the photomasks used and dispersive nature of the substrate; which were not considered in the FDTD numerical model. In addition, numerical simulations revealed that notch type U-shaped array THz filters with onset spanning from 0.8 to 1.1 THz may be designed and fabricated by scaling the dimensions of the U-shaped structures.

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A - 05

LUMINESCENT PROPERTIES OF ALKALINE EARTH SILICATE MATERIALS DOPED RAVE EARTH

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Abstract.

The alkaline earth silicate phosphors doped and co-doped rave earth - $Ca_2MgSi_2O_7$:RE, with RE=Eu, Tb, Dy - were synthesized by solid-state reactions. The results of X-ray diffraction measurement exhibit the phosphors could were synthesized by grinding and sintering at 1100^{o}C in 30 minus with three continuous times. For the Eu doped samples and synthesized under a weak reductive atmosphere (by CO gas) the Eu^{3+} ions were reduced to the Eu^{2+} ions. The photoluminescent spectra of received phosphors show that we can get the blue, green and red radiation which are essential for creating white light.

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A - 06

ELECTROMAGNETICALLY INDUCED TRANSPARENCY IN A FIVE-LEVEL CASCADE SYSTEM UNDER DOPPLER BROADENNING

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Abstract.
Electromagnetically induced transparency (EIT) is a quantum interference effect which makes a resonance medium become transparent and steeper dispersive for a probe light field under induction of other strong coupling light field. The effect was introduced theoretically in 1990 [1] and experimentally verified in 1991 [2]. Since then, EIT has attracted a tremendous interest over the last years due to its unusual properties and promising potential applications, such as all optical switching, slow-light group velocity, quantum information, nonlinear optics at low light level, enhancement of Kerr nonlinearity.

In the early year of EIT study, three-level configurations were the main objects giving single-window EIT signature. It is worth to mention here that the linear and nonlinear susceptibilities of such three-level systems are well understood and able to represent analytically. Such sufficient knowledge has promoted significant progress in implementation of applications related to EIT phenomena. Extension from single to multi-window EIT is currently of interest from practical perspective due to it gains diversifying usefulness. As an example is to simultaneously support slow group velocity for pulses at different frequencies [3, 4] in which light fields has advantage in production of quantum entanglement.

In this work, based on a simple analytical method developed in Ref.[5] for a cold medium, we extend to a hot EIT medium. Using the dipole and rotating-wave approximations, an analytical expression of EIT spectra is derived as a function of controllable parameters, as temperature, intensity and frequency detuning of coupling light. Variations of EIT spectra with respect to the parameters are investigated and compared to recent experiments. We see a tremendous agreement between our theoretical results and experimental observations.

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A - 07

ELECTROMAGANETIC PROPERTIES OF NEARLY SELF-COMPLEMENTARY METASURFACES AT TERAHERTZ FREQUENCY

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Abstract.

Metasurfaces are two-dimensional artificial structures that are designed to have electromagnetic functionality. Various electromagnetic devises have been developed especially in the microwave and terahertz frequency ranges [1]. The typical examples are a band-pass and band-reject filters designed by a metal mesh and metal disk array, respectively. The metal mesh and the metal disk array have mutually complementary structures and also show the complementary electromagnetic properties. This relation between the complementary complex transmission coefficient of an original pattern t and that of its complementary pattern t_c satisfy a relation $t + t_c = 1$. If the original pattern coincides with the complementary one, the pattern is self-complementary and $t = t_c = 1/2$ independently with frequency.

A checkerboard pattern is one of the self-complementary patterns. It is, however, impossible to fabricate the "perfect" checkerboard pattern because the adjacent metallic squares must intersect at a point with no area [2]. Therefore, the electromagnetic responses of the checkerboard patterns change abruptly by whether the tops of the adjacent metallic squares are connected or not. Although the "perfect" self-complementary checkerboard pattern does not exist, Nakata *et al*. demonstrated that the metallic checkerboard patterns in which the resistivity is introduced between the metallic squares exhibit $t = 1/2$ independently with frequency [3]. In this work, we fabricated nearly perfect self-complementary checkerboard patterns by electron-beam lithography. The complex transmission coefficient of $t \sim 1/2$ was observed. This phenomenon is attributed to the enhancement of the resistivity in the thin connection area and the randomness included in the structures.

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A - 08

VACUUM ULTRAVIOLET FLUORESCENCE OF PEROVSKITE FLUORIDE CRYSTALS FOR SHORT WAVELENGTH APPLICATIONS

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Abstract.
The vacuum ultraviolet (VUV) absorption edges of perovskite fluoride crystals as making them potential short wavelength light sources. The VUV fluorescence of perovskite fluoride crystals such as potassium magnesium fluoride ($KMgF_3$) and barium lithium fluoride ($BaLiF_3$) is investigated using an extreme ultraviolet free electron laser (EUV-FEL). Both fluoride crystals grown by the Czochraski technique exhibit fluorescence in the VUV range due to cross luminescence. $KMgF_3$ has fluorescence peaks at 145 and 165 nm with 290 and 270 ps lifetimes, respectively. On the other hand, $BaLiF_3$ has broad fluorescence from 158 to 280 nm having a sharp peak at 160 nm. The sharp peak at 160 nm has a fast lifetime of 130 ps, while the 170 to 280 nm broad shoulder has a lifetime of 300 ps. These results on perovskite fluoride crystals will lead towards their application as solid-state-based short wavelength light sources.

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A - 09

QUANTUM MASS ACQISITION IN SPINOR BOSE-EINSTEIN CONDENSATES

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Abstract.
Although the quasi-Nambu-Goldstone mode (qNG), an extra gapless excitation that does not originate from spontaneous symmetry breaking, has been predicted to appear in a wide range of systems from high-energy to condensed-matter physics, the experimental seek of it remains a big challenge since the emergent energy gap due to quantum fluctuations, i.e., quantum mass acquisition, is usually very small [1-9]. We show that the atomic spinor Bose-Einstein condensates, which can be manipulated and measured with a high accuracy using optical techniques, is a promising arena for the probe of such a peculiar excitation as the energy gap turns out to be two orders of magnitude larger than the zero-point fluctuation energy [10]. This unexpectedly large energy gap is a consequence of the dynamical instability in the spinor condensate. The propagation velocity of the qNG mode is also found to be decreased by the fluctuations in particle-number-density as opposed to phonons.

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A - 10

LOW TEMPERATURE PHOTOLUMINESCENE OF STRAINED GaAs/AlGaAs MQWs ON SAPPHIRE USING EPITAXIAL LIFT-OFF TECHNIQUE

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Abstract.

This study reports the efficacy of epitaxial lift-off (ELO) technique to introduce tensile strain on a Molecular Beam Epitaxy (MBE) -grown $GaAs/Al_{0.3}Ga_{0.7}$ multiple quantum well (MQW) sample, demonstrated by photoluminescence (PL). The introduction of strain to heterostructures is well-studied due to its ability to alter electronic properties and band structure. In this work, we demonstrate the efficacy of the ELO technique as an alternative method of applying tensile strain by investigating observable changes in the sample band structure through PL. The sample was grown on <100> oriented semi-insulating GaAs substrate and the epitaxial film consists of twenty pairs of p-doped 90 Å $GaAs$ wells separated by 120 Å-thick $Al_{0.3}Ga_{0.7}$barriers, a 0.5 µm $GaAs$ buffer layer and a 0.2 µm sacrificial $AlAs$ layer. Two 4x4 mm pieces were cleaved from the sample, one served as the as-grown reference and the other underwent the ELO process, where the AlAs layer was chemically etched and the GaAs buffer side was bonded to a sapphire substrate. The PL spectra of the on-sapphire sample shows similar features indicating that the ELO processes did not introduce additional strain to the film at ambient temperature. Strain was applied by means of difference in the thermal expansion coefficients between the film and the host. At room temperature and higher, GaAs and Sapphire share comparable coefficients of thermal expansion [1]. However, at low temperatures, the coefficients of thermal expansion for GaAs [2] is an order of magnitude higher (10^{-6}/K) for hexagonal sapphire (10^{-7}/K) [3], thus tensile strain on the MQWs can be applied at low temperatures. PL measurements were obtained between 10 K and 120 K. At 10 K, PL of the on-sapphire sample revealed a ~12 meV redshift for the 1C-1HH peak, indicating tensile strain [4], attributed to the hydrostatic component of the biaxial strain experienced by the sample. Another notable feature was the prominent valence band splitting [5] found for the on-sapphire sample, while the splitting is absent for the as-grown. The energy shifting and lifting of valence band degeneracy indicated the presence of strain. Temperature-dependent PL was also obtained, showing different amounts of tensile strain as temperature increases. In conclusion, results from low temperature PL showed that ELO is an effective means of applying tensile strain without the use of more expensive or cumbersome equipment.

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CONTROLLING OPTICAL BISTABILITY IN A FIVE-LEVEL CASCADE EIT MEDIUM

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Abstract.

Optical bistability is one of the most intriguing and interesting fields of research in quantum and nonlinear optics. There can be a large number of potential applications in optical sciences and related fields, such as all-optical switches in optical communication and signal processing. In the early year of the research [1-2], the main consideration was centered on optimizing the size of devices, switching times, operating powers, operating temperatures and other operating conditions. The advent of electromagnetically induced transparency (EIT) [3] has provided an excellent chance to promote ahead the research field because the EIT medium has several important properties, as extremely large nonlinear response, low absorption, and actively controllable threshold of bistability.

In the beginning of research on optical bistability in EIT media, three-level configurations were mainly of interest. Although the three-level configurations opened up some promising applications, owing to large nonlinear response induced in a narrow spectral transparent region only, they are however somehow limited in practice. Extension from the single to multi-window EIT medium having large nonlinearity is therefore of extensively interest [4]. Recently, five-level cascade EIT configuration has been introduced that may be an interesting candidate to controllable enhanced self- Kerr nonlinearity at multiple frequencies [5]. Up to date, to our best knowledge, nevertheless, optical bistability of such five-level cascade EIT medium has not yet been investigated.

Of particular interest to the present work, we have developed an analytical model for EIT enhanced self-Kerr nonlinearity in a five-level cascade system [1]. Such analytical result is used in this work to model a five-level EIT based bistability. Influences of controllable parameters, as intensity and frequency detuning of a coupling field, on properties of optical bistability of the system are investigated. The results can be used as a guide to design of optical bistable devices working with low-light intensity at multiple frequencies.

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A - 12

RELATION OF THE COMPOSITION, PARTICLE SIZE, AND PHOTOLUMINESCENCE IN SnO_2/SiO_2 NANOCOMPOSITE DOPING WITH Eu^{3+} IONS

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Abstract.

In this report, we present the results of our research on SnO_2/SiO_2 nanocomposite doping with Eu^{3+} ions. The investigated samples were prepared by sol-gel method with different compositions of SnO_2 and Eu^{3+} concentration. X-ray diffraction (XRD) patterns show tetragonal rutile structure of SnO_2 nano particles in the samples after an annealing process. Crystalline and sizes of SnO_2 nanoparticles in the SiO_2 matrix are investigated. The relation between constitution with different annealing temperatures and Eu^{3+}-related photoluminescence (PL) are presented. In particular, we show energy transfer process between SnO_2 nanoparticles and Eu^{3+} ions. Two observed major emission bands at around 590 and 612 nm correspond to the magnetic dipole transition, $^5D_0$-$^7F_1$ and electric dipole transition, $^5D_0$-$^7F_2$ in the 4f-shell of the Eu^{3+} ions, respectively, vary with the different SnO_2 constitutional components. The Eu^{3+}-related PL intensity changes with annealing temperatures and attains the highest value for the annealing temperature at around 900^{o}C. While the molar ratio of 90/10 for the SiO_2/SnO_2 gives the highest Eu^{3+}-related PL intensity.

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DEVELOPMENT OF HIGH COHERENCE 193 nm SOLID STATE LASER

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Abstract.
The high coherent, high power 193 nm ArF lasers are useful for interference lithography and microprosessing applications. In order to achieve high coherence ArF lasers, we have been developing a high coherence 193 nm solid state laser for the seeding to a high power ArF laser.
A schematic diagram of the laser system is shown in Fig. 1. The laser system consists of a narrow-band Ti:Sapphire oscillator seeded by a 904-nm external cavity laser diode (ECLD), a Pockels cell, a 6-pass amplifier, a 4-pass amplifier, a 2-pass amplifier and a wavelength conversion system. The pump power of 80 W is split to the oscillator with 12 W and to 3-stage amplifiers with 15 W, 25 W and 28 W respectively. Here we employed LBO for the second harmonic generation (SHG), BBO for the fourth harmonic generation (FHG) and CLBO for the sum frequency mixing of FH with a Nd:YVO_4 laser (1342 nm) to generate a 193-nm light. In order to stabilize the frequency, we modified Hansch method [1] for our system. The Pockels cell was used for the exact synchronization among the Ti:Sapphire laser, the Nd:YVO_4 laser and the ArF laser and for the optimization of the pulse width. The repetition rate was 6 kHz, corresponding to the ArF laser. This high repetition rate along with a low gain at 904 nm brings serious thermal lens effects in the Ti:Sapphire amplifiers because the higher pumping intensity is required to keep a necessary gain. The thermal lens effects were successfully solved by dividing an amplifier into 3 parts, resulting in an output power above 10 W with M^2~1. This 904-nm output was converted to 3.8 W in SH, 0.5 W in FH, and finally to 210 mW at 193 nm. This research was supported by the New Energy and Industrial Technology Development Organization (NEDO).

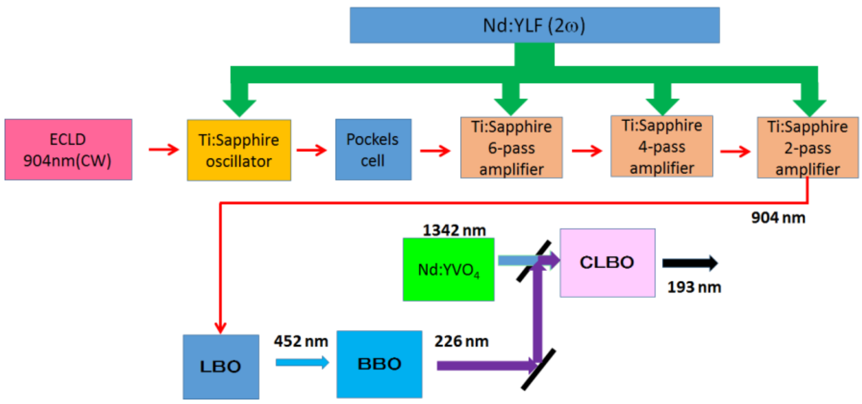

Fig. 1. *Schematic diagram of the 193 nm solid state laser system.*

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A - 14

EIT IN LAMBDA CONFIGURATION: MULTILEVEL MODEL AND MODEL WITH STRUCTURED CONTINUA

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Abstract.

According to the Feynman rule in quantum mechanics, there are different paths connecting initial state of an arbitrary physical system with its final one. The total probability amplitude of transition between these two states is the sum of the probability amplitudes for each path separately. They are complex, so this superposition leads to interference effects which are similar to interference phenomena in optics.

One of the most interesting interference effects is Electromagnetically Induced Transparency (EIT): The propagating beam of electromagnetic radiation is effectively not affected by the interaction with the medium, although medium undergoes a certain complex evolution. The properties of the medium are modified by another strong field leading to the effect that the incident beam of a weak probe field is not absorbed during its passage through this medium.

Another quantum interference effect is autoionization (AI) effect, in which quantum interference paths including both the discrete levels and continuum levels play a crucial role. This effect was considered in numerous papers starting from the classical work of Fano [1].

It is interesting and useful when we consider both interference effects AI and EIT phenomena together. In our talk we present some new results concerning EIT in Lambda scheme, both for models involving discrete levels [2-4] and those containing structured continua [5,6]. We propose another mechanism which leads to the multipeak structure of the observed spectra, namely the model with several autoionizing states, or equivalently, with Fano structured continua.

In the problems mentioned above, we assume that the laser light is monochromatic. However, a real laser is never perfectly monochromatic, so in the all phenomena which have been considered, we should extend to the more realistic case, when the laser width should be taken into account [7].

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A - 15

SYNTHESIS AND LUMINESCENCE PROPERTIES OF SiO_2-SnO_2 AND SiO_2-ZnO NANOCOMPOSITE FILMS DOPED WITH RARE EARTH IONS (Eu^{3+}, Er^{3+})

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Abstract.

SiO_2-SnO_2 and SiO_2-ZnO nanocomposite films doped with rare earth ions were synthesized by sol-gel method and spin-coating process. Wide band gap SnO_2 and ZnO semiconductor quantum-dots embedded in the insulator SiO_2 glass are obtained by heat treatment processes. Structural and morphology of the films were characterized by X-ray diffraction spectra and Scanning Electronic Spectroscopy (SEM). Luminescence properties have been analysed as a function of sample composition and thermal treatment. The results show that rare earth ions are partially partitioned into the nanocrystalline phase. An efficient UV excitation of the Eu^{3+} and Er^{3+} ions by energy transfer from the SnO_2 or ZnO nanocrystal host is observed. The mechanism of rare earth excitation and emission is discussed through the absorption of SnO_2, ZnO and the effect of excitation energy.

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INTERPLAY BETWEEN STRAINS AND DEFECTS IN HIGH POWER DIODE LASERS

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Abstract.
The packaging induced strain is known as one major source of defect generation even in unaged high power diode lasers [1-3]. Knowledge about their microscopic nature will be urgently required for creating more robust semiconductor device architectures. Vice versa, defects created in high power diode lasers contribute to the internal strain within the laser structure [4]. Therefore, strain and defects are strongly correlated and both influence device reliability. In this study, we will show some evidences for defect-strain relations that we observed in some particular devices. Afterwards, we will discuss the quantification of microscopic defects and an internal strain-defect relationship that show the link between different types of defects and internal strain.

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A - 17

DEVELOPMENT OF SURFACE-ENHANCED RAMAN SCATTERING PLATFORM FROM HARVESTED SILICON NANOWIRES

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Abstract.

Silicon nanowires (SiNW) decorated with silver nanoparticles (AgNP) was used as versatile platforms for detection of analytes through surface-enhanced Raman scattering (SERS). The AgNP enhance nearby electromagnetic fields, that is, the incident and Raman-scattered light, through surface plasmon resonance. This amplification of electromagnetic fields occur at approximately ~10 nm from the metallic surface [1]. Areas in SERS substrates that provide particularly large enhancement of electromagnetic fields are called hotspots. In this study, the SiNW serve as platform for deposition of AgNP, as well as providing numerous hot spots for which analytes could be adsorbed.

Silicon nanowires were synthesized using silver-assisted electrochemical etching of p-type (100) silicon. Silver nanoparticles were deposited on the SiNW by immersion in a solution of HF:$AgNO_3$. The samples were annealed at 200°C to form spherical nanoparticles [2]. The SiNW with AgNP were then harvested and laid out on SiO_2 substrate for easier imaging. The harvesting technique produces a network of nanowires in which analytes could easily be trapped in between adjacent nanoparticles, thus providing multiple SERS hot spots. We demonstrate the capability of the harvested SiNW with AgNP by the enhancement of the Raman spectra of rhodamine 6G, a commonly used SERS dye.

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A - 18

TRADEOFF BETWEEN NARROWING OPTICAL BAND GAP AND ENHANCING ELECTRICAL CONDUCTIVITY OF Au/Ag NANOPARTICLE MODIFIED TITANIUM OXIDE FILMS

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Abstract.

The n-type semiconducting titanium oxide thin films are well-known as electron transporting interlayer in solar cells [1, 2]. Favorable characteristics of interlayers in solar cells are wide band gap, high optical transmittance and high electrical conductivity. Modifying titanium oxide films with metal nanoparticles would increase electrical conductivity but reduce optical band gap [3]. We developed Au and/or Ag nanoparticles/titanium suboxide (TiO_x) compositefilms on glass substrates using solution-processed route. This study explores a tradeoff between narrowing optical band gap and enhancing electrical conductivity of nanostructured TiO_x films by controlling Au and Ag nanoparticle concentration in titania.

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A - 19

QUEST FOR SOLITONS

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Abstract.
In this talk we summarize many years of our research in the hunt for solitons (stable solutions) in the complicated systems, where no analytical methods are available. In such a case one need to relay on variational methods [1]. They have long been used as a semi-analytical method to approximate localized states of nonlinear systems [2]. The method is based on the substitution of an *ansatz* (trial configuration of the wave field with a finite number of parameters) into the Lagrangian of the equation, and seeking critical points in the finite-dimensional subspace. It is very surprising how accurate predictions one can get provided an appropriate *ansatz* is used. In our talk presented by one of us (M. T.) we will show how this methods works:

- **(a)** in the case of stabilization of three-dimensional light bullets by a transverse lattice in a Kerr medium with dispersion management [3].
- **(b)** in the case of two-dimensional solitons in media with stripe-shaped nonlinearity modulation [4].
- **(c)** in the case of three dimensional breathers created using Feshbach resonances in a three-dimensional Bose-Einstein condensate [5].
- **(d)** in the case of soliton collisions in the quasi one-dimensional potential, taking harmonic potential as an example [6].
- **(e)** in the case of spontaneous symmetry breaking of solitons trapped in a double-channel potential [7].

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A - 20

PREPARATION AND CHARACTERIZATION OF CdS/CdO THIN FILM

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Abstract.
CdO is an n-type transparent semiconductor with wide energy band gap and high electrical conductivity while CdS thin films are regarded as one of the most promising materials for heterojunction thin film solar cells. These properties are essential for a wide range of application such as photodiodes, phototransistors, photovoltaic and transparent electrodes. CdS/CdO Thin Film has been prepared by Spray Pyrolysis technique and characterized by XRD, SEM and UV-Vis techniques. Glass and conducting Fluorine doped Tin Oxide (FTO) have been used as substrates in this work. The effect of the substrate temperature on the structural, morphological, optical and electrical properties of the thin film has been observed.

Keywords: *photovoltaic, CdS/CdO Thin Film, Spray Pyrolysis, substrate temperature.*

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A - 21

FABRICATION OF MICRO-CHANNELS IN SILICON CARBIDE USING FEMTOSECOND LASER IRRADIATION AND ACID ETCHING

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Abstract.
By using 800-nm femtosecond laser irradiation and chemical selective etching with hydrofluoric acid, micro-channels were fabricated in silicon carbide. The morphology and chemical compositions of the channels were characterized by using scanning electronic microscopy equipped with an energy dispersive X-ray spectroscopy. The formation mechanism of SiC channels was attributed to laser-induced micro-explosion in silicon carbide and the reaction of the laser-induced micro-explosion affected zones with hydrofluoric acid. The channel is almost circular in shape and its radius is about 1.5μm. In addition, the depth of the micro-channel could be controlled by changing the laser average power. This technique has potential applications in biosensor, microelectronics and microelectromechanical system and photonics.

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CONTROLLING SELF-KERR NONLINEARITY IN MULTI-LEVEL CASCADE EIT SYSTEMS

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Abstract.

The Kerr nonlinear medium plays an important role in both fundamental research and application. In most cases of using Kerr medium, a strong nonlinear response is often needed to gain conversion efficiency. However, due to weakness of Kerr nonlinearity of traditional optical materials, several theoretical proposals have not yet been experimentally observed. Finding materials having large Kerr nonlinearity is therefore of interest to realize nonlinear processes at low-light intensities. An excellent proposal to attain this goal is to use lights working in vicinity of atomic resonances under electromagnetically induced transparency (EIT) [1,2]. In addition to a dramatic reduction of resonant absorption, the behavior of steeper dispersion leads to greatly lengthened interaction time; EIT media, therefore, become ideal for the applications needing materials having large nonlinear response [2-5].

In this work, using density-matrix theory, a self-Kerr nonlinear coefficient is derived for the cases of three-, four- and five-level cascade systems. Variations of the self-Kerr coefficient with respect to the frequency and intensity of a strong coupling light are investigated in detail. It is shown that the self-Kerr nonlinearity is basically modified and greatly enhanced in the spectral regions corresponding to EIT transparent windows. Furthermore, sign, slope, and magnitude of the self-Kerr coefficient can be controlled with frequency and intensity of the coupling light. Such controllable Kerr nonlinearity can find interesting applications in optoelectronic devices working with low-light intensity at multiple frequencies.

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EFFECT OF LIGHT INTENSITY AND ANNEALING SEQUENCE ON PHOTOCONDUCTIVITY OF TITANIUM DOPED NICKEL OXIDE THIN FILMS

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Abstract.
Nickel oxide (NiO) thin films are widely used as electrochromic layers in electrochromic devices [1]. Introduction of dopant metals such as titanium (Ti) would enhance electrochromic capacity and durability of NiO [2]. In this work, sol-gel derived Ti doped NiO (Ti-NiO) films were fabricated onto indium-doped tin oxide (ITO) coated glass substrates by dip coating followed by annealing at 350 °C for 1.5 hr. Such high temperature post-annealing can cause the fluctuation of work function and transmission of underlayer ITO that affects the device performance [3]. Thus the pre-annealing (annealing NiO powder prior to thin film formation) was also attempted. This work investigates the effect of annealing sequence and light intensity on the photoconductivity of Ti-NiO films measured using Vander Pauw four point probe method. Increasing light intensity promotes the photoconductivity of Ti-NiO while changing the annealing sequence does not modulate the photoconductivity of Ti-NiO films.

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CHARGE TRANSPORT PROPERTIES OF HETEROJUNCTIONS IN NANOCOMPOSITES USED FOR ORGANIC SOLAR CELLS

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Abstract.

Charge transport is an important factor that affects on the efficiency of performance of organic solar cells (OSCs). To prepare OSCs, polymeric nanocomposites containing heterojunctions of the conjugate polymers and inorganic nanoparticles were prepared by spin-coating. Polymer luminescence quenching was observed depending on the nature of nanostructral particles embedded in polymer matrix. Actually, the higher quenching of the polymer fluorescence observed in presence oxide of nanoparticles proves a highly-efficient charge transfer of the photogenerated electrons through polymer/oxide heterojunctions. Characterization of the nanocomposite films showed that both the current-voltage (I-V) characteristics and the photoluminescent properties of the nanocomposite materials were significantly enhanced in comparison with the standard polymers. OSCs made from these layers exhibited much improved photo-electrical energy conversion efficiency.

A - 25

MANIPULATING ULTRA COLD ATOMS TOWARDS THE DEVELOPMENT OF QUANTUM TECHNOLOGIES

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Abstract.

Recently many attentions have been paid to the quantum technologies based on ultra cold atoms such as atomic interferometry, atomic clock, and quantum information processing.In this talk, I will review our recent investigations about the manipulation of ultra cold atoms towards the development of quantum technologies. Atomic interferometry using ultra cold atoms is a promising technology for the precision measurements of acceleration and rotation. We have developed fast coherent matter wave sources using Bose-Einstein condensates (BEC) of Rb atoms, and we have studied the atomic interferometry and coherent matter wave optics [1-3].

Quantum information processing using cold atoms is also anpromising for the quantum computer and quantum simulation. We have investigated the Rydberg blockade effect between atoms using a single cold Rb atom in a micro optical trap [4]. Using this Rydberg blockade effect, it is possible to realize the entanglements between two atoms [5]. I will show our recent investigation towards the realization of the entanglement between more than two atoms.

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A - 26

POSSIBILITY OF GENERATION AND AMPLIFICATION TO HIGH POWER OF ULTRAVIOLET SHORT-PULSE Ce:LiCAF LASER EMISSION

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Abstract.

In this paper, we review the recent progresses in direct generation and amplification of ultraviolet laser emissions using Ce^{3+}:$LiCaAlF_6$ (Ce:LiCAF) material as a gain medium. Basing on comparative and analytical studies, we have investigated improvements and proposed possibilities of generation and amplification to high power of ultraviolet short-pulse Ce:LiCAF laser emission.

Key words: Ce:LiCAF crystal, ultraviolet, short pulse, laser generation, amplification.

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A - 27

HIGH-ORDER HARMONIC GENERATION WITH TWO COLOR LASER FIELDS

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Abstract.

High-order harmonic generation (HHG) that occurs in the interaction between an intense laser pulse and a gas medium can provide a table-top coherent radiation source in the short wavelength range from the vacuum ultraviolet to the soft x-ray region [1]. The spectra, phases and polarizations of the HHG radiation can be analyzed to obtain information about molecular structure and attosecond dynamics. Therefore, the high-order harmonics are very interesting for applications in physics, chemistry, and biology [2]. Use of two-color mixing is a promising technique to achieve high conversion efficiency [3] and tunability of high-order sum and difference frequencies in harmonic generation [4] which could be a source for the production of attosecond pulses. In this study, by investigating the HHG with two color laser fields consisting of 1400 nm as a fundamental field and 800 nm as an additional field we show that the additional field modifies phase-matching condition of different electron trajectories contributing to harmonic emission that leads to the generation of different harmonic frequencies from various pathways. Therefore additional spectral components and in some cases a quasi-continuum spectrum are generated. Moreover, the additional 800 nm field can control the phase-matching condition of HHG through the variation of the dipole phase. This technique allows us to enhance the visibility of a Cooper minimum (CM) in the harmonic spectrum which results solely from the electronic structure of the medium [5] and represents a ‘‘fingerprint’’ of the orbital leading to the precise measurement of the electronic structure.

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MEASURING VISCOSITY OF A LIQUID USING VIDEO MICROSCOPY OF BROWNIAN MOTION OF MICRO-SIZE PARTICLES IN AN OPTICAL TRAP

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Abstract.

Recently, we have constructed suscefully an optical trap to control motion of micro-size spherical particles. A CCD camera is used to create a video of the spheres' motion. By recording Brownian motion of polystyrene spheres in water inside the optical trap, custom routines are used to examine the video and to identify and track the particles from one frame to the next.

In this work, based on observation of micro-size particles in the constructed optical trap, we determine the mean squared displacement of the particles versus time with assuming that the drag force on an individual sphere is well obeyed the Stokes' law. The viscosity of water is then calculated within 1% error.

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NUMBER DENSITY DEPENDENCE ON SURFACE-ENHANCED RAMAN SCATTERING USING GOLD NANOSPHERE AND GOLD NANOROD

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Abstract.
Surface enhanced Raman scattering (SERS) is a powerful analytical tool for obtaining vibrational information for molecules on metallic substrates. Gold and silver nanoparticles were commonly used to enhance Raman intensities. In this work, an investigation into the number density dependence on SERS of the molecules adsorbed to the gold nanosphere (NS) and gold nanorod (NR) surfaces. The NR with appropriate aspect ratio was synthesized to have longitudinal surface plasmon resonance aligned with the excitation laser wavelength. The experimental results show that the NR substrates produce stronger SERS enhancement than NS substrates under similar experimental conditions. The SERS intensities increase with a nonlinear growth of the number density, which are likely results in the hot-spot effect.

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MICROWAVE PHOTONIC SYSTEM APPLIED TO REFRACTIVE INDEX MEASUREMENT

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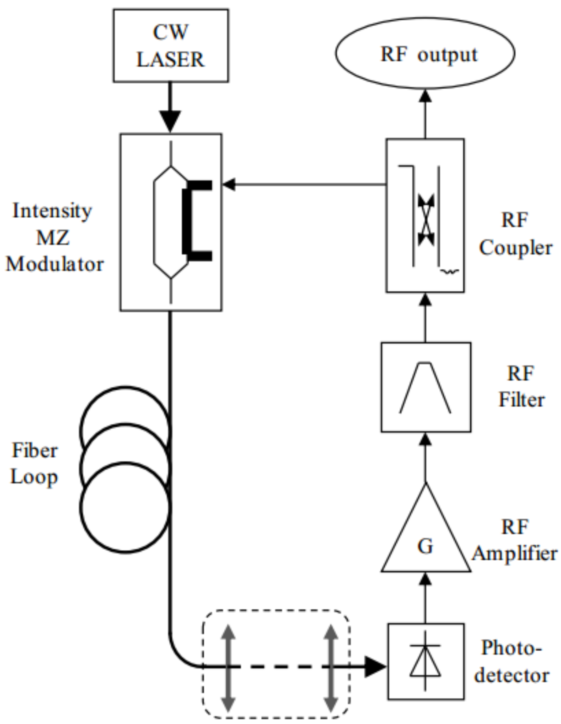
Abstract.

Microwave photonic systems are nowadays mainly developed for telecommunication and especially in case of high data rate optical communications. But there is also a trend to apply some of these new technologies to other research fields such as environment or biochemical studies. Among these, a very promising system is the optoelectronic oscillator (OEO) invented at the end of the 20th century [1]. This oscillator is based on delay line effect, and thanks to the use of an optical fibre, it is possible to achieve long delay (some µs) with very small insertion losses. Such an oscillator can produce very low phase noise microwave signals by direct synthesis, and the applications in the field of telecommunications, radars, and also secured communications, are very promising, even if there are still no commercial systems available. In this system the oscillation frequency is determined by the propagation time in the oscillator loop, and it is mainly due to the optical fibre. Any change in the optical fibre loop induces a change in the oscillation frequency. For telecommunication applications this is a drawback, but for sensing system it can becomes an advantage and that is the key of the sensing method [2].



In this paper we present a modification of the classical structure for refractive index measurement. The fibre loop is opened and a fibre-to-fibre coupler is placed in the global loop as shown in the figure. On the base plate of the coupler, it is possible to put a kind of fluorescence cell, transparent to the laser beam, and filled by the liquid to be analysed. Moving from the oscillator with an empty cell to the oscillator with a filled cell induces a change in the oscillation frequency, its variation being related to the variation of the refractive index in the cell. From this principle, we can see that it is possible to make instantaneous or time changing refractive index measurement. This method presents important advantages. The detection of the index variation can be considered as in-situ, the response time being the one of the oscillator is short (some µs). Long term variations should also possible to register under the condition that the oscillator is well operated and monitored. By this way it is possible to follow the refractive index variation for a chemical or biochemical reaction and so to follow the evolution of the reaction itself.

We also discuss about the conditions for making accurate measurement. A technique for taking into account the possible drift of the oscillation frequency due to temperature variation will be introduced in order to improve the accuracy of long-term measurements. Some preliminary results are provided showing the feasibility of our method.

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A REVIEW ON THE STATUS OF TERAHERTZ TIME-DOMAIN SPECTROSCOPY RESEARCH IN THE PHILIPPINES

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Abstract.
The special properties of TeraHertz (THz) radiation such as high transmission to normally opaque materials and ability to probe signature molecular vibrations provides a wide range of possible applications, especially in the fields of biomedical imaging [1], pharmaceuticals [2] and semiconductor technology [3]. Ultrafast THz spectroscopy is a relatively new research field and the lack of suitable THz emitters and detectors demand the development of more intense THz radiation sources and sensitive THz detectors. This work presents an overview about the current status of THz research in the Philippines, particularly on the current works that are being done at the National Institute of Physics. Highlights on the terahertz optoelectronic properties of (i) surface modified GaAs [4], (ii) vertically aligned silicon nanowire arrays [5] and (iii) novel LT GaAs films for THz applications [6] will be presented. The THz emission spectra from these materials are investigated via TeraHertz-Time Domain Spectroscopy (THz-TDS) using a mode-locked Ti:sapphire femtosecond laser, generating 100 fs optical pulses centered at 800 nm wavelength. The carrier dynamics and recombination efficiency of these materials are assessed. The strong THz emissions are correlated to the surface morphology, structure and optical properties obtained from complementary characterization tools such as photoluminescence spectroscopy, photoreflectance spectroscopy and x-ray diffraction measurements.

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QUANTUM OPTICS WITH QUANTUM DOTS ON OPTICAL NANOFIBERS

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Abstract.
Enhanced spontaneous emission (SE) with efficient coupling of quantum emitters to nano-waveguides is of great interest in the field of quantum optics, especially in the context of quantum information science. To achieve this, various methods have been implemented by directly fabricating nanostructures on the waveguide itself. Examples include, diamond nanobeam cavities [1], silicon nitride alligator photonic crystal (PhC) waveguides [2], and PhC nanofiber cavities [3]. Here, we introduce a method complementary to the above methods, where a PhC cavity is created by a composite structure consisting of two independently controllable elements: an external defect-mode grating and a nanofiber. Using this technique, we realize enhanced SE from single q-dots on the nanofiber.

A conceptual diagram of the system is shown in Fig. 1. The composite PhC cavity is created by mounting the defect-mode grating on the nanofiber. Typical designed parameters [4] are as follows: grating period (Λ_g) of 320 nm, slat width ($\alpha\Lambda_g$) of 96 nm, grating depth of 2 μm, number of slats 350, and nanofiber diameter of 600 nm. We assume a wavelength of 800 nm. We arrange a defect at the center of the grating with a length of $1.5\Lambda_g$ (480 nm). Using a FDTD method, we perform simulations of the above design. We simulate for the total photon flux into the fiber guided modes from a dipole source placed at the center of the defect. We estimate the enhancement factor (EF) by taking the ratio of the photon flux at on- and off-resonance wavelengths of the cavity. The EF value was found to be 6 and 14 with FWHM of 0.8 and 0.45 nm for the x- and y-polarizations respectively. No enhancement was found for the zpolarization. Assuming randomly polarized dipoles, the peak value is limited to 7 after averaging.

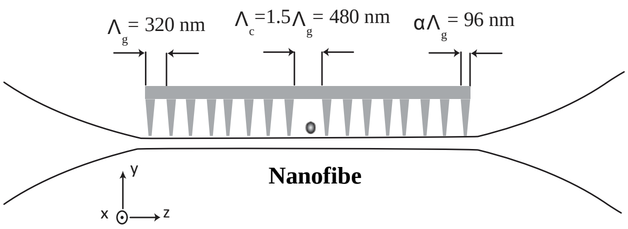

***Fig. 1**. Conceptual diagram of the system.*

We fabricated the defect-mode grating using the above parameters. The diameter of the nanofiber used in our experiments was around 600 nm. In the present experiments, we use colloidal q-dots (CdSeTe/ZnS, emission wavelength around 800 nm) for quantum emitters. We deposit single q-dots by touching a droplet of q-dot solution on the nanofiber. The propagation loss induced by the deposition is 0.6%. We perform photon correlation measurements using a Hanbury-Brown-Twiss setup to **2000** quantify the number of q-dots. We measure the photoluminescence (PL) spectrum using an optical multichannel analyzer (OMA). A typical PL spectrum is shown in Fig. 2 for the optimum single q-dot position in the cavity. One can readily see the strong enhancement at the expected wavelength. The single q-dot deposition was confirmed by the observed anti-bunching behavior with dip value of 0.3 as shown in the inset of Fig. 2. We estimate the EF by taking the ratio of the PL spectral intensity at on- and off-resonance wavelengths of the cavity. The obtained value was 3.8 (±0.4) with FWHM of 1.2 (±0.11) nm. It should be mentioned that the observed FWHM is resolution limited.

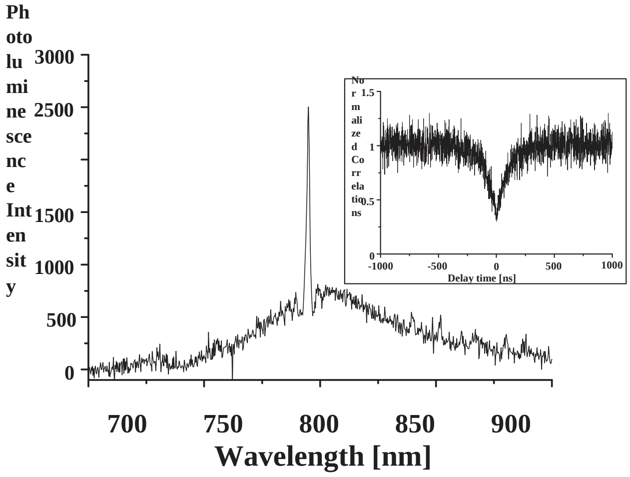

Fig. 2. *Observed PL spectrum from a single q-dot.The inset shows the measured anti-bunching signal.*

We demonstrated enhanced spontaneous emission on a nanofiber using a composite PhC cavity. The composite technique can be extended to various other nano-waveguides, and may provide a flexible alternative to the direct fabrication of nanostructures on the waveguide itself.

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TERAHERTZ EMISSION OF POROUS SILICON

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Abstract.

Terahertz (THz) emission from porous silicon (pSi) with different porosities were demonstrated and investigated. The pSi samples were fabricated via electrochemical etching of bulk crystalline Si in an HF ethanoic solution. The supplied anodic currents were varied for each sample to vary the porosities [1]. Surface morphology and the intended 1μm thickness of each sample were confirmed via Scanning Electron Microscopy. Samples were then subjected to Reflectance and Photoluminescence Spectroscopy (PL Spectroscopy) to investigate the reflectivity and the optical emission of the pSi samples, respectively. From the reflectance spectra, index of refraction was calculated [2]. The porosities of the fabricated samples were derived from the calculated index of refraction by using Bruggeman effective medium approximation [2 and 3]. Prior to the optical emission of the samples, the carrier recombination efficiency was also investigated. In addition, THZ - Time Domain Spectroscopy (THz – TDS) was performed to measure the THz emission of the samples. The trends of the PL and THz spectra were compared in relation to the surface modification of the crystalline bulk Si as in reference: [4]. It has been shown that due to the structure of pSi in relation to its porosity, the absorption of the excitation source results to the generation of THz.

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OPTICAL SPACER-INDUCED ABSORPTION ENHANCEMENT IN POLYCARBAZOLE BASED ORGANIC SOLAR CELLS STUDIED BY FDTD OPTICAL SIMULATION

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Abstract.

Finite difference Time Domain (FDTD) method has become a widely used optical simulation tool for structural optimization of photovoltaic cells.Self-developing a FDTD simulation program using Fortran 90, the optical electric field distribution in poly[N-9''-hepta-decanyl-2,7-carbazole-alt-5,5-(4',7'-di-2-thienyl-2',1',3'-benzothiadiazole)]: C61 butyric acid methyl ester (PCDTBT:PCBM) organic solar cells has been studied.In addition, integrating the titanium dioxide (TiO_2) optical spacer of various thicknesses (10-50 nm)between active layer and cathode, the calculated spectral dependent optical absorption in modified PCDTBT:PCBM (60 nm) devices wasexamined as compared to those in the identical devices without optical spacer. Quantitative analysis indicates that optical spacer thickness of 20 nm facilitates the maximum absorption enhancement of 13.24 % in these devices. Strategy of integrating optical spacer of optimum thickness saves the usage of more costly polymer materials leading to realization of a cost-effective as well as efficient organic photovoltaic device.

Keywords: optical simulation, FDTD, organic photovoltaic cell, optical spacer.

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NONLINEAR QUANTUM SCISSORS AND ENTANGLEMENT GENERATION

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Abstract.

Quantum-optical states engineering is the one of the most interesting subjects of study in last years. Different concepts of such states and methods of their production and manipulation have been presented widely in literature [1]. They have potential applications in atomic and molecular, solid-state and nanosystem physics, and also in the quantum information theory. The latter have recently given a stimulating pulse for the investigation of the states defined in finite-dimensional Hilbert space.

Nowadays finite-dimensional states (FDS) seem to be especially important from the point of view of the quantum information theory. In particular, two- or multimode states are relevant and they are commonly discussed in a context of quantum entanglement which is the one of the most important resources for quantum computing.

In our talk, we review the methods which generate FDS by using nonlinear optics elements. This family of the quantum-optical models we refer to as *nonlinear quantum scissors* (NQS) [2]. As an example we consider a nonlinear coupler with two Kerr-like oscillators mutually coupled by continuous linear interaction and excited by a series of ultra-short external pulses [3,4]. We show that the system behaves as NQS in such a way that it can be treated as *qubit-qubit* system. We derive analytic formulas for the probabilities of the states involved in the system's evolution and show that they differ from those already discussed in the literature and corresponding to the continuously excited models. In addition, we discuss about the possibility of generating maximally entangled Bell states with high efficiency. Our results are verified by numerical simulations.

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GaAs-AlGaAs CORE-SHELL NANOWIRES FOR THz APPLICATION

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Abstract.
Progress in nanoscale electrical, optical and optoelectronic circuits have drawn attention to semiconducting nanowires (NW). Recent THz studies have been conducted on bare GaAs wires to survey carrier transport and recombination. Interest in III-V semiconductors like GaAs and their integration to Si substrates have recently gained popularity due to its viability for photovoltaic applications. Recent work done by our group investigated THz emission from GaAs-AlGaAs core-shell NWs using Thz Time Domain Spectroscopy (THz-TDS), which have not yet been as widely investigated as bare NWs. Core-shell NW samples were grown using a Riber32P Molecular Beam Epitaxy (MBE) utilizing a bottom-top approach, which proceeds via Vapor-Liquid-Solid (VLS) method. Au nanoparticles are deposited on to Si <111> or Si <100> substrates which act as a catalyst for GaAs NW growth. Au can be directly deposited using an electron beam evaporator, where the sizes of the Au catalyst can be controlled by deposition time (delos Santos). An alternative method uses an anodized-aluminum-oxide (AAO) as a template for depositing Au nanoparticles on the substrate, which can produce around 1.64-1.96 x 10^8 core-shell NWs per square centimeter. Results from THz-TDS experiments showed that THz emission originates from both the GaAs core and the AlGaAs shell. Upon selective excitation, the THz power spectra showed a broader bandwidth of THz emission under an excitation wavelength of 775 nm, which can excite both the GaAs core material and the AlGaAs shell, compared to an excitation wavelength of 850 nm, which only excites the GaAs core. Photoluminescence from the sample showed bulk-like spectra with a peak close to the GaAs bandgap. The spectra exhibited a slight blueshift and high-energy side broadening. PL from the AlGaAs core can also be observed. Time-resolved PL measurements at 77K and 300 K showed that the recombination rates of the AlGaAs-shell are consistently faster (~530 ps, ~400 ps) than the GaAs-core (~970 ps, ~600 ps). This supports the increased frequencies of Thz emission. Additionally, photoluminescence excitation spectroscopy (PLE) conducted at 77 K revealed that at excitation energies above the AlGaAs (shell) bandgap, the GaAs PL intensity abruptly increased. This phenomenon was attributed to shell-to-core carrier transfer, which was also supported by TRPL measurements. The GaAs core showed a single exponential decay, while a double exponential decay was observed for the AlGaAs shell. The shorter decay found for the AlGaAs shell was surmised to be from the shell-to-core carrier transfer while the longer decay was attributed to carrier recombination.

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INTENSITY DISTRIBUTION OF VIBRATIONAL TRANSITIONS IN THE $2^1\Pi \rightarrow 1^1\Sigma$ BAND SYSTEM OF NaLi MOLECULE

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Abstract.

The alkali-metal diatomic molecules have been attractive for both theoreticians and experimentalists because they have a relatively simple electronic structure. Their electronic structure is frequently considered by theoreticians as a very convenient model for introducing approximations which can be further applied to more complex molecular systems. From the experimental point of view, alkali-metal diatomic molecules with their main absorption bands lying in the visible and UV regions are very convenient objects for investigations with modern laser spectroscopy techniques. Investigations of alkali-metal molecules have recently experienced additional impetus since the formation of molecular Bose-Einstein condensates [1] and the exploring of molecular dynamics [2]. Precise knowledge on population distribution of vibrational levels is needed for setting experimental parameters.

In this work, using Numerov-Cooley method [3], a set of 17 wave-functions corresponding to v = 0 to 16 in the $2^1\Pi$ state of NaLi molecule is calculated by numerical solving the radial Schrödinger equation (RSE) with IPA potential energy curve determined in Ref. [4]. Intensity distribution of vibrational transitions in the $2^1\Pi \rightarrow 1^1\Sigma$ band system is investigated. The distribution shows minima and maxima for alternative vibrational levels. Such behavior is important for choosing optimization excitations in studies related to molecular dynamics.

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COMBINED DEPOSITION TECHNIQUES OF Si:H THIN FILMS WITH EMBEDDED NANOPARTICLES AS A PERSPECTIVE FOR PHOTONICS, PHOTOVOLTAIC OR EVEN THERMOELECTRIC APPLICATIONS

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Abstract.

The technological processes of the deposition of hydrogenated silicon thin films /Si:H/ with amorphous /a-Si:H/ or later microcrystalline /µc-S.H/ structures are developed already a few tenth years. While the Plasma Enhanced Chemical Vapour Deposition (PECVD) technique is widely used for deposition of TV screens it seems the deposition of large scale thin film diode structures for photovoltaic application is up to now limited by low efficiency which we need to increase for large production of solar panels. The very low photoluminescence /PL/ or electroluminescence /EL/ of a-Si:H thin films or their structures and non-direct band gap of crystalline or microcrystalline silicon limits their application in photonics. But up to now it is open question how those thin films can be modify by embedded semiconductor nanoparticles. We have developed combined deposition technics and we study quality of deposited thin films. We expect embedded nanoparticles can increase PL and EL of Si:H thin films as well as make them convenient for photovoltaic or thermoelectric application.

The PECVD is based on possibility to transport needed elements at a form of gases or vapours of convenient liquids into deposition chamber. But it is not so easy to transport some elements at room temperature by any form like that. For those elements it is necessary to use a common transport method from solid state to solid state - we can use quite standard techniques as it is Vacuum Evaporation /VE/ or Sputtering or Reactive Sputtering. We can deposit thin film multi-structures changing periodically both processes. When we apply a convenient temperature annealing, we can stimulate reaction between elements of thin films. For it we usually need high temperatures which in many cases change a quality of the thin films. It is a case of amorphous or microcrystalline form of hydrogenated silicon /a-Si:H or µc-Si:H/. There are reasons why we study processes as Plasma Treatment for formation of compounds, their structures and size of NPs on the surface of Si:H thin films.

Another possibility how to deposit NPs on the surface of Si:H thin films when the PECVD is interrupted is the Laser Ablation /LA/ or Reactive Laser Ablation technique /RLA/. A convenient condition for evaporation of targets /energy in pulse and focusing/ by laser, the selection of

material of the target and reactive atmosphere in the case of RLA for the deposition of nanoparticles gives many possibilities how to influence the size and quality deposited nanoparticles.

For deposition of materials convenient for thermoelectric application the Reactive Deposition Epitaxy /RDE/ is applied in UHV chambers. Those structures are studied in non-hydrogenated form up to now. Our developed deposition methods allow the study of their quality in hydrogenated form. Our work is performed with financial support by LH12236 (MSMT KONTAKT II, Czech Republic).

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EFFECT OF THERMAL ANNEALING ON THE NANOSTRUCTURALAND OPTICAL PROPERTIES OF SILICON CARBIDE THIN FILMS PREPARED BY PECVD

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Abstract.
Fabrication of hydrogenated nanocrystalinesilicon carbide (nc-SiC:H) has attracted much attention in the energy and semiconductor industries due to its unique and useful features.These include a wide optical band gap; high thermal conductivity, high breakdown electric field, and high electron drift velocityetc., and make it a suitable semiconductor material for operating at high temperature, high power and chemically hostile environment.Nc-SiC:H can be tailored according to the need of several different technological applications. Especially, a wide band gap crystalline silicon carbide can be used as window coatings in high efficiency solar cells and a suitable matrix in which nc-Si can be generated.

In this work, stoichiometric silicon carbide thin filmswere deposited on Si and Al_2O_3substrates by plasma enhanced chemical vapor deposition (PECVD). During deposition, the substrate temperature, SiH_4, CH_4, H_2 flow rates and RF power were kept at 600 ^oC, 30, 90, 30 (sccm) and 200W, respectively. The films were post-deposition annealed in the N_2-H_2atmosphere at temperatures ranging from 700 to 1300^{o}Cfor 3 hours.In order to investigate the nanostructural and chemical features, X- ray diffraction, and FT-IRspectroscopy had been used., Nano-indenters and photoluminescence spectroscopy was used to studymechanical, optical features of the films, respectively. It was found that as the annealing temperature was increased from 1000 to 1300 ^oC, nanocrystalline silicon carbide (nc-SiC) formed and the mean crystallite size varied from ~ 2 to ~ 5 nm. The thermal energy at high annealing temperatures broke the Si-H and C-H bonds, and rearranged the amorphous network to generate local crystalline states, resulting in the formation of nc-SiC. The photoluminescence (PL) peaks varied in the wavelength range of ~ 425 to ~ 470 nm with annealing temperature. The change in the maximum PL peak position was related to the optical band gaps of the films ranging from ~ 2.92 to ~ 2.64 eV, which depends on the size of the SiCnanocrystallites in the amorphous matrix and the consequent quantum confinement effect.

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CATHODOLUMINESCENCE, PHOTOLUMINESCENCE OF Y_2O_3: Eu^{3+} NANOPHOSPHORS

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Abstract.
Y_2O_3:Eu^{3+} nanophosphors were prepared by combustion method, using ethylene diamine tetra acetic acid (EDTA-Na_2) and Urea as fuel at ~350°C and 600°C respectively. The resulted particles were characterized by Powder X-ray Diffraction. The morphology observation of the samples shows that their nature was foamy, fluffy and porous. Map Sum Spectrum EDS were studied in detail together cathodoluminescence spectra at 5, 10, and 15 KV excitation. The photoluminescence excitation spectra (PLE) and photoluminescent spectra (PL) were studied. PL of Y_2O_3:Eu^{3+} nanoparticles exhibit red luminescence (612 nm) under 254, 394 and 462 nm excitation. The dependence of their luminescence properties on annealing temperature was also studied. The results showed that nanoparticles of Y_2O_3:Eu^{3+} were synthesized by fuel EDTA-Na_2 assisted combustion technique at low temperature and in short time. Cathodoluminescence and thermoluminescence were studied in order to find application.

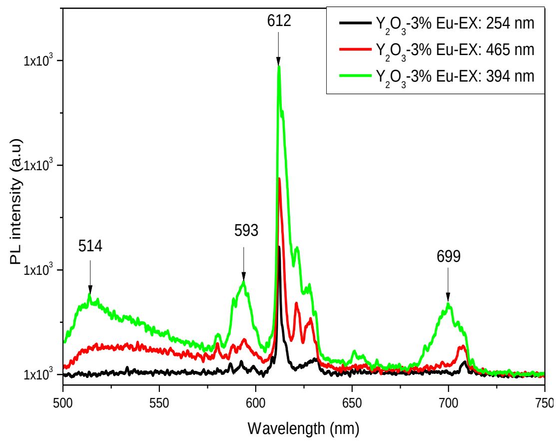

Fig.1

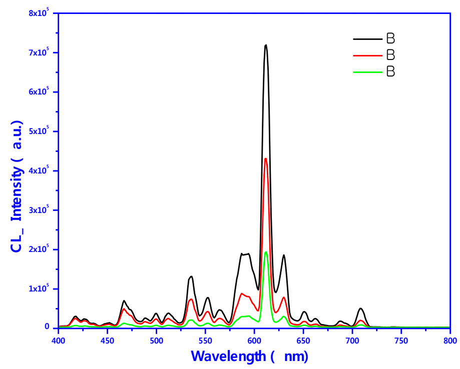

Fig.2

Figure 1: Photoluminescent spectra of Y_2O_3 nanophosphors doped 3 mol% Eu prepared with EDTA- Na_2 ,350 ^{0}C excitation by 254, 465 and 394 nm wavelength.
Figure 2: Cathodoluminescent intensities of Y_2O_3 :Eu^{3+} 3 mol% under 5, 10 and 15 KV excitation

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INFLUENCE OF AN ANTI-REFLECTIVE LAYER ON THE PHOTOVOLTAIC EFFICIENCY OF SiO_2/Si SOLAR CELL

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Abstract.

The anti-refractive layer in a solar cell plays as an important role in determining the open circuit voltage, short circuit current, fill factor and efficiency of the solar cell. The basic factor that affects the efficiency of a solar cell is the reflection of light from the front surface of a solar cell. The reflection coefficient can be reduced by deposition of the antireflective coating (ARC) on the top solar cell surface. The effects of interfacial oxide layer thickness on the performance of the device efficiency have been studied. The structural, optical and electrical properties of anti-reflective layer were studied at different annealing temperatures and times. Characterization technique includes X-ray diffraction (XRD), UV-visible absorption spectroscopy and electrical conductivity measurement. The effect of interlayer on the device efficiency was investigated.

Keywords: anti-reflective coating, interfacial oxide layer.

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CHANGING GRAPHENE PROPERTY WITH EPOXY GROUP BY UV-ZONE TREATMENT AND OXIDIZING SOLUTION

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Abstract.

As changing graphene properties is vital to promote it as electronic device [1], we developed graphene modified with epoxy group by two simple methods: UV-ozone treatment and oxidizing solution method. By Hall measurement, the graphene mobility was decreased with increasing temperature of UV-ozone treatment at 30^oC, 50^oC, 70^oC and 120^oC. At low oxygen pressure (less than 160 torr) the oxidation degree is not significant. Additionally, Raman spectroscopy showed the disrupted π-π structure in graphene that was increased with the reacting time of oxidizing solution method. Based on the above identification we supposed that epoxy group was established on graphene surface.

Keywords: functionalization, graphene, UV treatment, graphene oxidation, ozone.

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MULTI-CHANNEL MICROELECTROMECHANICAL TUNABLE MICRO-RING RESONATOR FILTER

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Abstract.

A recent tendency pays attention to electromechanical tunable micro-resonators for integrated optical signal processing such as modulating, filtering, and switching [1-4]. This is due to low power consumption, high speed, compact size, and simple fabrication process of micro-resonators based on electromechanical actuation mechanism. Add-drop filters using microdisks and microtoroids were reported, where bandwidth of resonant curves is tunable [3-4]. Resonators having function such as wavelength tunable notch filter and transmission-width tuning based on microring were also reported [5-7]. Although multi-channel filter using thermal tuning mechanism was already reported [8], multi-channel filter based on electromechanical tuning mechanism is still lacking. Advantages of multi-channel filters are capacity of spectral shaping, large bandwidth, and high extinction ratio. In this paper, we present design, fabrication, and characterization of a multi-channel tunable filter based on electromechanical tuning mechanism. The filter is composed of three identical microring resonators optically connected in series through an input waveguide. Each ring resonator is an add-drop filter with a free-spectral-range of 10 nm. The resonant wavelength is tuned by electrostatic comb actuation. The extinction ratio of spectrum is 15 dB. The bandwidth is tunable from 0.9 nm to 2.5 nm by shifting the resonant wavelength of each ring resonator sequentially. The proposed device is promising for large scale integrated reconfigurable photonic systems.

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EFFECTS OF NONLINEAR ABSORPTION AND THIRD-ORDER DIPERSION ON SOLITON PROPAGATION IN OPTICAL FIBER

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Abstract.

Solitons are a fundamental phenomenon in nonlinear dynamics and have attracted the attention of researchers from the physical and mathematical sciences. Solitons were found in nonlinear optics, plasma physics, particle physics, biological systems and Bose-Einstein-condensation. Especially, optical solitons have been the subject of intensive theoretical and experimental studies for many years. These special types of optical wave packets appearing as the result of interplay between dispersion and nonlinearity are of special interest because of their important applications in telecommunications [1,2,3] and optical data processing[4,5]. In this paper, we derive a general propagation equation in the frequency domain and show how it leads to a generalized nonlinear Schrodinger equation when it is converted to the time domain. We use this equation to study propagation of ultrashort optical pulses in the presence of self-phase modulation, nonlinear absorption and third-order dispersion. Soliton formation and propagation are investigated by analytical method. Simultaneously, we use numerical methods to simulate the pulse propagation process, and to verify the soliton solutions obtained from analytical methods.

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OPTICAL PROPERTIES OF ALKALI ALUMINOBORATE GLASS DOPED Eu^{3+} ION

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Abstract.
Optical properties off alkali alumino borate glasses prepared with the chemical composition $xNa_2O + (30 – x) Li_2O + 69 B_2O_3 + 10 Al_2O_3 + 1 Eu_2O_3$ (where x = 0, 5, 10, 25 and 30 in wt%) have been studied by varying the alkali contents (Na^+ and Li^+). Structure of the prepared glasses has been explored through XRD, FTIR and Raman spectral analysis. Optical characterization has been made using UV-Vis absorption, excitation, luminescence and decay curves of the present glasses. Bonding parameters (δ and β) have been determined through the absorption spectra and the negative value of δ indicates the ionic nature. The phonon side band (PSB) associated with the $^7F_0 \rightarrow {}^5D_2$ excitation transition is used to determine the electron – phonon coupling constant and the local structure of the Eu^{3+} ions with its surrounding ligands. Judd-Ofelt (J – O) intensity parameters Ω_λ (λ = 2, 4, 6) were obtained from the emission spectra and the same is used to estimate the transition probability (A), stimulated emission cross-section (σ) and branching ratios (β_R) for the excited levels of the Eu^{3+} ions.

Keywords: Borate glass, Phonon side band, Judd – Ofelt parameters.

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CONTROLLING NEGATIVE INDEX OF REFRACTION IN AN ATOMIC GASEOUS EIT MEDIUM

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Abstract.

Electromagnetically induced transparency (EIT) [1] is a quantum interference effect that permits propagation of light through an opaque atomic medium without attenuation. EIT manifests itself as a narrow window of transparency within the absorption profile and it is accompanied by a steep dispersion of the refractive index. The EIT effect was first proposed theoretically in 1989 [2] and experimentally verified in 1991 [3]. Since then, theoretical and experimental studies of EIT have attracted great attention due to their potential applications in many fields, such as low light nonlinear optics [4], quantum information [5], and atomic frequency standard [6]. Recently, another aspect concerning to EIT induced negative index of refraction in atomic gases was proposed [7]. Since then, EIT induced negative refractive index has been attracted considerable attention due to its extraordinary electromagnetic properties, such as reversal of Doppler shift, anomalous refraction, amplification of evanescent waves, reversed circular Brag phenomenon, sub-wavelength focusing, and so on.

In this paper, using density matrix equations in the framework of the dipole- and rotating-wave approximations we derive an expression of index of refraction for a weak probe light field as a function of controllable parameters of a sole controlling light. Variations of the index of refraction with respect to intensity and probe detuning of the controlling light are investigated. We find a controllable spectral region in which both permittivity and permeability are simultaneously negative under present of EIT. Such controllable negative index of refraction without absorption can find interesting applications in future.

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B-01

PRESSURE-INDUCED POLAR PHASES IN RELAXOR MULTIFERROIC $PbFe_{0.5}Nb_{0.5}O_3$

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Abstract.

The multiferroic materials, revealing a coupling between ferroelectric and magnetic orders, recently have become the focus of extensive scientific research. A coexistence of ferroelectric polarization and magnetic order in such materials provides a route for a construction of novel electronic devices with a possibility to control magnetic properties by electric field and vice versa [1].

The multiferroic $PbFe_{0.5}Nb_{0.5}O_3$, exhibiting a pronounced magnetoelectric coupling, is a promising basic compound for a development of piezoelectric, electrostrictive, capacitor and pyroelectric materials [2]. Due to a chemical disorder of magnetic Fe^{3+} and non-magnetic Nb^{5+} ions, having different charges and randomly occupying the same crystallographic sites, $PbFe_{0.5}Nb_{0.5}O_3$ demonstrates a relaxor ferroelectric behavior and a coexistence of the spin glass and long range magnetic order [3]. A study of the dielectric properties of $PbFe_{0.5}Nb_{0.5}O_3$ at moderate pressures up to 0.6 GPa revealed a reduction of the ferroelectric transition temperature, indicating instability of the ambient pressure rhombohedral polar phase [4]. In order to study in detail the high pressure effects on the crystal structure, magnetic and vibrational properties of relaxor multiferroic $PbFe_{0.5}Nb_{0.5}O_3$, we have performed powder X-ray and neutron diffraction, as well as Raman spectroscopy experiments in the 0 - 30 GPa pressure range. Our results demonstrate the application of high pressure leads to successive *R3m-Cm-Pm* structural phase transitions at P = 5.5 and 8.5 GPa. Both transitions are associated with anomalies in pressure behaviour of several stretching and bending modes of oxygen octahedra as well as Fe/Nb localized vibrational modes. The G-type antiferromagnetic order remains stable upon compression up to 6.4 GPa, implying multiferroic properties of pressure-induced phases. The Néel temperature increases with a pressure coefficient $(1/T_N)dT_N/dP = 0.012\ GPa^{-1}$.

The observed pressure-induced phenomena in $PbFe_{0.5}Nb_{0.5}O_3$ are in drastic contrast with conventional multiferroics, exhibiting a general tendency towards a suppression of polar phases and/or magnetoelectric coupling under pressure.

B-02

$CuWO_4$/SBA-15 COMPOSITE PREPARED USING MICROWAVE ASSISTED METHOD AND ITS PHOTOCATALYTIC ACTIVITY

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Abstract.

The $CuWO_4$ nanoparticles encapsulated in mesoporous silica ($CuWO_4$/SBA-15) was successfully synthesized by fast microwave-assisted method. The prepared samples were then characterized using Xray diffraction (XRD), transmission electron microscopy (TEM), nitrogen adsorption-desorption,UV -vis diffuse reflectance and infrared absorption spectroscopy. It has been found that, the $CuWO_4$ nanoparticle had a small crystalline size and was well dispersed on the mesoporous structure SBA-15.The photodecomposition of methylene blue in aqueous medium was selected to evaluate the photocatalysis performance of $CuWO_4$/SBA-15. The results revealed that $CuWO_4$/SBA-15 showed much higher photodegradation ability of methylene blue than pure $CuWO_4$.

Keywords: *$CuWO_4$/ SBA-15,Mesoporous materials, Photocatalytic.*

B-03

INVESTIGATION AND SIMULATION OF THE CARRIER TRAPPING PROCESS AT Si-SiO_2 JUNCTION INTERFACE OF MOSFET DEVICES

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Abstract.

Today, MOSFET transistors are widely used in integrated circuits and have the importance in electronics industry. The structure of MOSFET transistors includes three material layers which constitute two main junctions: metal - oxide and oxide - semiconductor junction. These junctions are essential components and play the decisive role for properties of the devices, such as: depend on field effect to create channel, the semiconductor-oxide junction which connects drain and source creates a channel in the operation of the transistor. Therefore, the quality of the device is affected in the investigation by the defects, especially at semiconductor - oxide junction. In this study, we used TCAD software to simulate a MOSFET and have successfully designed the measurement system by pulsed transient charge trapping method to determine traps at the semiconductor-oxide junction to limit leak current in these devices.

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B-04

STUDY OF POLYMER QUENCHING PROPERTIES OF MEH-PPV/QDs HETEROJUNCTIONS USED FOR QUANTUM-DOT SOLAR CELLS (Q-SC)

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Abstract.

Conjugate polymer Poly[2-methoxy-5-(2'-ethyl-hexyloxy)-1,4-phenylene vinylene] abbreviated to MEHPPV was used for preparation of heterojunctions with quantum dots (QD) of CdS and CdSe. MEHPPV-CdS and MEHPPV-CdSe samples were prepared by spincoating MEH-PPV solution on transparent electricaly conducting (ITO). Under illumination of the light wavelengths ranging from 450 to 600 nm, the polymer luminescence quenching was observed for both samples, but the quenching coefficient of MEHPPV-CdSe/ITO was much larger than that of MEHPPV-CdS/ITO. This results in better charge separation at the MEHPPV/CdSe interface in comparison with MEHPPV/CdS. With such a specific charge separation property, MEHPPV/CdSe-QD can be used for producing quantum solar cells (Q-OSCs). For a Q-OSC with laminar structure of Al/MEHPPV-CdSe/PEDOT/ITO the photovoltaic energy conversion efficiency (PEC) was reached a value as high as 2.5% that is comparable to the PEC of a dye-sensitized solar cell using thin nanocrystalline TiO_2 electrodes.

B-05

DYNAMICS OF DNA MOLECULES IN OPTICAL TWEEZER

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Abstract.

Motion of the biological microparticle, especially DNA molecules in the optical trap or tweezer (Fig.1) depends on optical force ($F_{gr,z}$ or $F_{gr,\rho}$), Brown force (F_B) and its elastic force (F_{el}), which depending on extension (ρ). In this paper we present the general Langevin equation (GLE) describing the dynamics of DNA molecules in an optical tweezer (Eq.1). Before deriving the equation, the model of spring-like worm DNA molecules (Fig.2) and their elastic force, the model of optical tweezer to trap DNA molecules, and the model of Brownian motion of DNA molecules in the fluid are analysing. The actions of all force on dynamic of DNA molecules in optical tweezer are simulated by finite difference equation (Eq.2) coresponding to GLE and discussed (Fig.3)

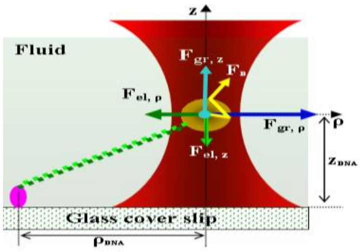

Fig.1 *Cartoon of an often-used experimental geometry.*

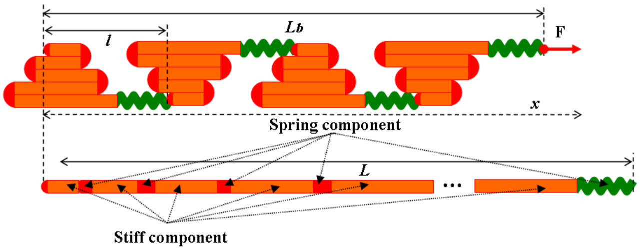

Fig.2. *Model WLC of fibrillin molecule.*

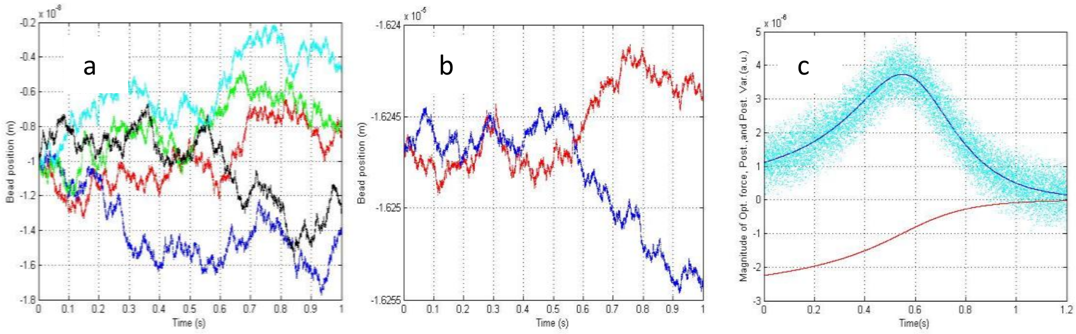

Fig. 3. a) *Motion of Brownian bead (polystyrene) in water; b) Motion of bead lingking to λ-phage DNA in water; c) Optical force (solite curve upper, motion of bead lingking to DNA under optical force (solite curve downer) and position variance (dot curve).*

The outlook: Contents of this article are limited as the beginning questions, which can be spanded to investigate in detail the DNA molecules under action of optical tweezer. There are remain important questions, which influence on the dynamic of DNA numbered as: i) DNA in different phage (different elastic parameters); ii) DNA in different fluid; iii) the influence of total energy, beam waist, duration,… of laser beam on the stability of bead; iv) the optical force threshold to hold the bead in tweezer center;….

B-06

THEORETICAL AND EXPERIMENTAL STUDY OF ANATASE TiO_2 CODOPED WITH VANADIUM AND NITROGEN

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Abstract.

A combined experimental and theoretical investigation of the effect of vanadium and nitrogen co-doping on the photocatalytic activity of TiO_2 thin film is presented. Vanadium and nitrogen co-doped TiO_2 thin films have been fabricated by solgel method. The as-prepared thin films have been evaluated by Uv–Vis spectroscopy, X-ray diffraction (XRD), scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDS) and photo-degradation of methylene blue. The experimental results indicate that V and N co-doping extends the absorption of TiO_2 into the visible light region, so TiO_2:(V, N) thin films show high photocatalytic activity for the degradation of MB under visible light irradiation. Meanwhile, the crystal structures, electronic structures and density of states of vanadium and nitrogen co-doped anatase TiO_2 were calculated by the DFT method to study the mechanism for the enhanced photocatalytic activity of TiO_2. A confirmation of the experimental results through theoretical calculations.

Keywords: *codoped, TiO_2, photocatalytic activity, DFT, thin film.*

B-07

RESEARCH AND CREATION OF RAMAN REFERENCE SPECTRUM FOR INVESTIGATING REVELANT ACTIVE PHARMACEUTICAL INGREDIENTS AND DRUGS

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Abstract.

Raman spectroscopy is known as a rapid, non-destructive measurements technique. For this reason, it is the most promising tool for on-line process monitoring and analysis in the pharmaceutical industry, especially in controlling the drug quality and detecting counterfeits. Sine Raman spectroscopy, the chemical fingerprint, carries information about not only the chemical structure of active pharmaceutical ingredients (APIs) but also excipients in the dosage forms, so that using Raman spectroscopy, researchers can analyze the chemical composition of all components to create an unique authentic spectrum that representing for each drug formula. However, Raman spectra of organic compounds consist of signals from all chemical bonds and the interaction among them in a formula, so they are completely complex. In order to obtain chemical information from these spectra, it is necessary to know Raman patterns of the possible components in a mixture. In this paper, we present the collection of Raman spectra of some APIs in raw materials and in dosage forms that can serve as the reference Raman spectra for investigating drugs in the market. Examples of Raman spectra of Sildenafil, Ibuprofen, Isoniazid and Lamivudin are shown, together with band assignments to the reference products.

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B-08

A STUDY OF FLASH-LAMP PUMPED PASSIVELY Q-SWITCHED Nd:YAG/Cr:YAG LASERS

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Abstract.

This report represents our theoretical and experimental studies of a flash-lamp pumped Nd:YAG laser and passively Q-switched with a Cr:YAG saturable absorber. The optimal selection of cavity parameters (initial transmission of saturable absorber and output couler reflectivity) for obtaining the required ouput energy and pulse-width is carried out with an analytical model. The dynamic characteristics of lasing process is examined by numerially solving a rate equation system in which a time-dependent pumping rate and the recovery of gain and absorption are taken into account. The laser performance is verified by experiments and a good agreement with theoretical results is obtained.

B-09

THE STUDY OF POTASSIUM CHLORIDE (KCl) AND ORGANIC DYES EFFECTS ON THE GROWTH OF KDP SINGLE CRYSTALS

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Abstract.

Unremitting interest to potassium dihydrophotphate (KH_2PO_4, KDP) crystals is caused by their unique physical properties and high manufacturability. During recent few years the scope for the creation of new non-linear optical media based on complex combinations of water-solube inorganic matrixes with organic and inorganic impurity is being actively discussed in the scientific literature. Thereat, special consideration is given not only to the possibility of changing significant functional characteristics of the crystals, but also to the creation of new properties which are not peculiar to the pure crystal. In this study, single crystals KDP doped KCl and organic dyes Orange G ($C_{16}H_{10}N_2O_7S_2Na_2$), Amaranth ($C_{20}H_{11}N_2O_{10}S_3$), Rhodamine B ($C_{28}H_{31}C_lN_2O_3$) were fabricated by the method of temperature lowering. We study the distributions of organic dyes on the lattice crystal. The effects of KCl and organic dyes on the growth of single crystals KDP were surveyed, which compared the growth of single crystals of pure KDP in the same conditions. In addition, the correlation between doping concentration and crystal structure are also investigated.

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B-10

THE DYNAMIC RESISTANCE OF CdS/CdSe/ZnS CO-SENSITIZED TiO_2 SOLAR CELLS

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Abstract.

QDSSCs can create the high performance and low cost photovoltaic in the future. In this part, we prepared the photovoltaic based on a series TiO_2/CdS/CdSe/ZnS photoanodes by SILAR method. The absorption spectra of TiO_2/CdS/CdSe/ZnS photoanodes greatly extended in the visible region, while Photoluminescent spectra quickly extinguished (no show). The reason is that the energy level structure of the combination CdS, CdSe, ZnS quantum dots (QDs) is the TiO_2<CdS <CdSe <ZnS. So, the photoanodes can absorb many photons in each region and injection of excited electrons quickly into the conduction band (CB) of TiO_2. Furthermore, we also studied the influence of the SILAR cycles on the dynamic resistance, the lifetimes of electrons in the QDSSCs through Nyquist and Bode.

Keywords: *Solar cells, Quantum dots, SILAR.*

B-11

DETERMINATION OF PROPERTIES OF CVD DIAMOND DETECTOR BY USING PENELOPE

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Abstract.

Chemical vapour deposition (CVD) diamond is a very interesting material for the fabrication of radiation detectors. CVD diamond can withstand extremely hard radiation, high temperatures and in highly corrosive environments, and especiallyit is also close to "tissue-equivalent". The main purpose of this report is using program of simulation PENELOPE to determine the properties of CVD diamond detectors. The studies cover simulation of signal, the efficiency of CVD diamond detector depends on radiation energy, diamond thicknesses, source position and electrode materials.

Keywords: *CVD diamond detector, simulation with PENELOPE.*

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B-12

CELLULAR AUTOMATON ALGORITHMS APPLIED TO STUDY ON STRUCTURE OF LUMINESCENCE LEVELS OF NANOMATERIALS

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Abstract.

Cellular automaton – a mathematical element based on binary description of physical systems to study about creation and development of the system – is introduced by S. Wolfram [1], during his research in high energy physics and mathematics. This view point leads to a new kind of science to describe and simulate the development of the nature, and also have an astonishing analogy to ying-yang view point of Eastern philosophy.

This paper describe the first steps of applying methodology of cellular automaton, which describe the creation and development of physical systems, based on binary algorithms, into simulation of formation of luminescence levels of nanomaterials. Some theoretical calculation with materials system of Y2O3:Er photoluminescence nanomaterial will be described and discussed.

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B-13

UNUSUAL LUMINESCENCE DYNAMICS OF Dy^{3+} - DOPED TELLURITE BASED GLASSES: A CORRECTION FORJUDD-OFELT ANALYSIS TO THE THERMALLY POPULATED EXCITATION LEVELS

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Abstract.

For Dy^{3+} ion the excited term $^4F_{9/2}$ is very close to the next excited $^4I_{15/2}$ level (the energy separation is about 900 cm^{-1}), therefore both levels are populated at room temperature and luminescence takes place simultaneously from both the levels to the lower levels (6HJ, J= 9/2, 13/2, 15/2). This unusual luminescence dynamics contributes an error in the comparision between the measured and Judd-Ofelt calculated decay times of the excited $^4F_{9/2}$ level. In this paper, the life times with and without thermal population effect of the $^4F_{9/2}$ term for different host glasses are calculated and compared with the experimental results.

The luminescence bands originated from $^4I_{15/2}$ level and the Raman spectra of the different glasses are studied and the role of the phonon in the luminescence dynamics are discussed.

The transition rate from state $^4I_{15/2}$ to $^4F_{9/2}$ and other 6HJ (J= 9,11,13 and 15) states of Dy^{3+} was calculated using the dynamic equations and experimental luminescence spectra.

B-14

INFLUENCE OF FREQUENCY CHIRP ON PULSE PARAMETERS FOR THE SUPER-GAUSSIAN SHAPE LIGHT PULSE IN THE SATURABLE ABSORBER AND ACTIVE MEDIUM OF THE RING RESONATOR OF THE COLLIDING PULSE MODE LOCKING DYE LASER

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Abstract.

There are a lot factors that influence in pulse formation, pulse width and intensity of output laser pulses in the colliding pulse mode locking CPM ring dye laser. In this report, we present influence of linear and and nonlinear frequency chirp on the pulse parameters in the saturable absorber and active medium of the ring resonator of the CPM ring dye laser. The super-Gaussian shape light pulse is used for calculating in detail.

Keywords: *linear and nonlinear frequency chirp shape pulse, The super-Gaussian, ring resonator dye Laser, colliding pulse mode locking.*

B-15

INVESTIGATION OF TiO_2 FILMS FOR QUANTUM DOT SOLAR CELLS

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Abstract.

Quantum dot sensitized solar cells (QDSSCs) present a promising technology for next generation photovoltaic cells, having exhibited a considerable leap in performance over the last few years [1]. Invasion of Qdots in porous TiO_2 film is carried out using low temperature chemical process However, the recombination processes or defect surface occurring in parallel at the TiO_2–QDs–electrolyte triple junction constitute one of the major limitations for further improvement of QDSSCs. In this study, we fabricate TiO_2 films for the application in photoanode of quantum dot solar cells. The films are produced from TiO_2 commercial paste with print screen method to achieve appropriate properties. Film thickness, surface, structure and transmittance are investigated with profilometer, SEM, AFM, XRD, EDX and UV-Vis measurements. The films show suitable thickness of 6 and 12 μm, anatase structure, low roughness and high trasmission of about 80 % in visible region. Films are then irradiated with 365 nm-peaked UV light at different duration in order to reduce contact angle.Those films are covered with quantum dot by Silar method at different dipping cycles. Such decrease of wet angle enhances the adhesion of quantum dots onto TiO_2 films, which are shown in the UV-Vis, Raman and EDX spectra.

B-16

GOLD NANOPARTICLE-DOPED POLYMER-DYE LASER MEDIUM

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Abstract.

Development of a new laser medium based on gold-nanoparticle-dye-doped polymethyl metacrylate (PMMA) is investigated. Especially, the gold nanoparticle (GNP) under form of core-shell with silica core modified strongly absorption and emission fluorescent spectra of DCM laser dye. The fluorescent quenching and enhancement from DCM emission were observed at various concentrations of GNPs. Other hand, the stability of fluorescent intensity shows the thermal micro-lenses effect that is reason why photodegradation, is significantly decreased.

Keywords: *Nanomaterials, dye laser, plasmonic effect.*

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B-17

SYNTHESIS, OPTICAL PROPERTIES OF CdSeTe TERNARY ALLOY QUANTUM DOTS AND NATURAL DYE CURCUMIN

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Abstract.

The CdSeTeternary alloy quantum dots (QDs) have the great advantages for use as a sensitizer in the Quantum Dot Sensitized Solar Cell (QDSSC) application. Their absorption spectra and emission spectra can be varied by modifying composition without changing the size. The absorption region can extend toward longer wavelengths, to the near infrared (NIR), to harvest more light in the solar spectrum. In this report,we present the optical properties of CdSeTe alloy QDs, fabricated by chemical methods, that their optical characteristics can be adjusted by changing the molar ratio of component in quantum dots. By changing size and composition of quantum dots, the absorption and emission spectrum of QDs can be extended from red region as far as the near infrared (NIR) [1, 2]. The measurement of the photoluminescence quantum yields (QY) of QDs samples was also carried out, to assess the quality of fabricated alloy QDs. The relationship between composition and absorption or emission spectra was studied.

In addition, besides using QDs as sensitizer in solar cells, we studied the use of natural dye, such as curcumin, extracted from yellow tumeric in Vietnam, make sensitizer in solar cells. This report presents some first results on the extraction of curcumin from the yellow tumeric and the absorption and emission characteristics of naturalcurcumin. Several experimental results using natural curcumin in solar cells presented in this report.

B-18

SYNTHESIS AND INVESTIGATION THERMOLUMINESCENT PROPERTIES OF K_2GdF_5:Tb

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Abstract.

K_2GdF_5 doped Tb has thermoluminescent properties very remarkable such as high sensitivity with neutron and gamma dose. In this study, the materials K_2GdF_5 doped Tb^{3+} with concentration 2 mol%, 5 mol%, 10 mol% were synthesized by solid state reaction method. The reactions were proceeded in argon gas at a temperature of 620°C for 6 days. Materials K_2GdF_5:Tb are very sensitive to gamma and neutron dose, dosimetric peak appears at a temperature of about 200°C with heating rate of 2°C/s. The sensitivity of these thermoluminescent dosimeters are higher than dosimeters TLD 100 and TLD 900. They could be used in gamma and neutron dosimetry. The response of the glow curve peak intensity is very linear with dose. In addition, the reduction of TL intensity over time (fading) is very low. Calculated the value of trap depth E and order of kinetic b of peaks by single peaks of the glow curve fitting method. The research results show that materials K_2GdF_5 doped Tb^{3+} can be applied in gamma, beta and neutron dosimetry.

Keywords: *K_2GdF_5:Tb^{3+}, thermoluminescence, neutron dosimetry.*

B-19

HYDROTHERMAL SYNTHESIS AND PHOTOLUMINESCENCE PROPERTIES OF ZnO NANORODS

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Abstract.

ZnO nanorods were synthesized by hydrothermal method by varying the growth temperature, time and pH of the precursors. The formation of ZnO nanorods were confirmed by X-ray powder diffraction (XRD), Field emission scan electron microscopy (FESEM) and Energy-dispersive X-ray spectroscopy (EDX). The results demonstrate that the morphology and ordering of ZnO nanorods are determined by the growth temperature, the pH of the precursors and deposition time. ZnO nanorod morphology and surface-to-volume ratio are most sensitive to temperature and pH of the precursors. The width of ZnO nanorods can be controlled by the pH of the reactants and temperature. The influence of the chemical reactions, the nucleation and growth process on the morphology of ZnO nanorods are discussed. Photoluminescence properties of ZnO nanorods at room temperature were studied. The ZnO nanorods shown a broad green emission originates from defects related to the vacancies, interstitials of zinc and oxygen. The formation of the defects on the ZnO nanorods can be controlled via the synthesis parameters.

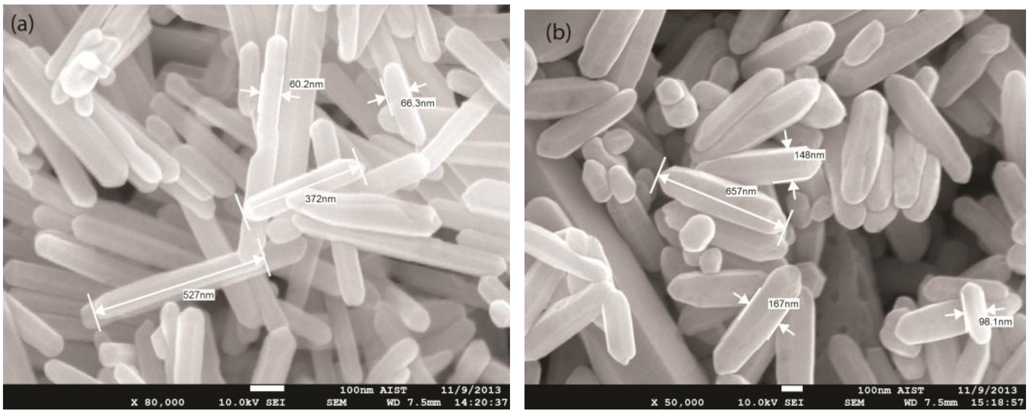

Fig. 1. *FESEM images of ZnO nanorods were synthesized at (a) 190 °C and (b) 230 °C.*

B-20

A COMPACT POCKEL CELL UNIT FOR Q-SWITCHING Nd:YAG LASER

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Abstract.

High power pulsed Nd:YAG lasers have become a versatile tool for research and industrial applications. In these lasers short and powerful laser pulses are generated mainly through active Q-switching of the laser cavity using Pockels cells. In this contribution we report the design and operation of a compact Pockels cell unit. The high voltage driving pulses up to 3 kV to switch the polarization property of the Pockels cell are generated through two series of high voltage MOSFET transistors connected in cascade. The repetition rate of our Pockels cell unit can reach up to 100 Hz. We present initial measurement data made with our Pockels cell to demonstrate its good performance.

B-21

ENERGY TRANSFER STUDIES OF Eu^{3+} IONS DOPED TELLUROBORATE GLASSES

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Abstract.

Eu^{3+} ions -doped telluroborate (TeB) glasses with difference concentration were prepared by the conventional melting procedure. Luminescence spectra and luminescence decay curves of $^5D_0$ level have been measured at room temperature. Judd–Ofelt theory has been used to evaluate the three intensity parameters Ω_2, Ω_4 and Ω_6. From this parameters, the lifetime of $^5D_0$ excited level has been caculated. The decay curves of the TeB glasses doped with 2.0 and 5.0 mol % of Eu^{3+} ions are non – exponential curves. These curves are well fitted to the Inokuti – Hirayama model for S = 6. The energy transfer parameters (Q, C_{DA}) and the critical distance (R_0) are calculated. The cross-relaxation mechanism is also discussed for TeB:Eu^{3+} glasses.

B-22

PROPERTIES PHOTOCATALYST OF ZnO/TiO_2 HETEROJUNCTION MODIFIED BY DILUTED HCl SOLUTION

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Abstract.

In this study, characteristics of ZnO/TiO_2 heterojunction fabricated by DC magnetron sputtering and chemical corrosion in HCl solution are reported. The crystal structure, morphology, effective area surface, photocatalyst property of ZnO/TiO_2 heterojunction, the decomposition of methylene blue solution under ultraviolet irradiation and the luminescence of terephthalic acid solution after photocatalyst process are characterized by XRD, SEM, AFM, OH rate analysis. The results show that ZnO/TiO_2 structures have high crystallinity, large effective area surface. The biodegradation of methylene blue solution and fluorescence intensity of terephthalic acid after photochemical reaction of ZnO/TiO_2 with chemical corrosion in HCl solution is higher than the cases without solution treatment; so, it brings much better performance and enhance photocatalyst effect.

B-23

ABSORPTION AND PHOTOLUMINESCENCE PROPERTIES OF CdSe/CdS CORE/SHELL NANOSTRUCTURES WITH THICK SHELL

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Abstract.

Colloidal CdSe/CdS core/shell nanocrystals (NCs) with thick shell have greatly improved photoluminescent properties (the high quantum yield and excellent optical stabilization). For this reason they have been attracted the mass attention from the reseachers. Here, we report the absorption and photoluminescence properties of CdSe/CdS core/shell NCs with thick shell. The CdSe/CdS NCs were synthesized by seed growth. Their morphology, size, crystal structure and optical properties were investigated by transmission electron microscopy, X-ray diffraction, absorption and photoluminescence spectroscopy. Interestingly, the simultaneous appearance of two emission peaks are observed for the CdSe/CdS NCs with thick shell. The origin of these emission peaks is discussed in detail.

B-24

STUDY DEPOSITION OF SiO_X FILM BY PECVD

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Abstract.

In many applications (ophthalmic lenses, car headlights, etc.), silicon oxide films are used as protective coatings in order to improve the mechanical properties of polymers. The Plasma Enhanced Chemical Vapor Deposition (PECVD), which allows deposition of dense films at temperature near the ambient, is particularly relevant for this. In this work, SiO_2-like films have been deposited by PECVD method in a RF plasma reactor with mixed gas O_2/HMDSO as precusor. The deposition rate, optical transmittance and refractive index of film are investigated. UV-VIS Spectrophotometric measurements show that all the films are SiO_2-like films, close to the thermal evaporation one, transparent from 400 to 1000 nm. Moreover, all the films present a good resistance to delamination and good protection for Al film against NaOH attack.

B-25

SPECTROSCOPIC CHARACTERISTIC OF Ba_2SiO_4: Eu^{2+} GREEN EMITTING PHOSPHOR

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Abstract.

Ba_2SiO_4: Eu^{2+} green emitting phosphors were synthesized by solid state reaction method with change of Eu^{2+} ion concentration. Result of X-ray diffraction shows that the samples have orthorhombic single phase structure. Luminescent spectra are a broad band with maximum peak at 503 nm. Emission spectra consist of 2 Gaussian peaks that were taken form by Eu^{2+} ions located at 2 different positions in the lattice. Luminescent intensity of the phosphor increases when concentration of Eu^{2+} ion increases and luminescent intensity is optimum with concentration of Eu^{2+} ion at 3 % mol. Influence of Eu^{2+} ion concentration to spectral characteristics and their role in the lattice are presented and discussed.

B-26

ON DYNAMICS OF THE FAST Er-RELATED PHOTOLUMINESCENCE MEDIATED BY Si QUANTUM DOTS

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Abstract.

Under pulsed laser excitation, a substantial part of Er^{3+} dopants in SiO_2 sensitized with silicon quantum dots is excited via ultrafast energy transfer processes [1, 2]. In the past, microscopic models for this excitation mechanism have been proposed, but their dynamics are not known. In this work, we describe in details the fabrication processes of a series of Er^{3+} doped Si-rich SiO_2 samples by sputtering methods. Samples of high concentration of Er^{3+} dopants [Er] $\approx$ 1-2 $\times 10^{20}$ cm^{-3} are obtained and estimated via energy-dispersive X-ray spectroscopy. The Si quantum dots with the average size of 2-3 nm are evaluated via optical bandgaps. Photoluminescence and excitation spectra of the samples also show the energy transfer between the Er^{3+} ions and Si quantum dots. We introduce the transient induced absorption (TIA) technique to monitor the dynamics of free carriers in Si quantum dots generated under femto-second fulsed laser excitation. The TIA spectral features indicate a fingerprint of the dynamics of the energy transfer process from Si quantum dots into specific higher excited states of Er^{3+} dopants within few pico-second time scales. Finally, we propose and discuss a model for this ultra-fast excitation process.

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B-27

AN ENSEMBLE SOLITARY PULSE TRAIN IN BACKWARD STIMULATED RAMAN SCATTERING

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Abstract.

Backward stimulated Raman scattering (BSRS) is a particularly interesting example of a resonant three-wave interaction [1-3]. In such interactions, the balance in energy exchange between the three components may result in the generation of a stable soliton-like structure [1]. In the case of BSRS, the interacting components are a forward propagating optical pump wave at frequency ω_p, a backward propagating optical Stokes wave at frequency ω_s, and a coherence wave in the Raman active medium at frequency $\Omega = \omega_p - \omega_s$. The coherence wave is proportional to the corresponding off-diagonal density-matrix element. It is a measure of the spatial correlation of the molecular excitation (vibration, rotation) created by the interaction of forward pump with the backward Stokes. From the solution of BSRS equations [3], it can be shown that the amplification of the backward Stokes by an infinitely long pump, results in a steady-state pulse of the squared secant-hyperpolic form (soliton). A recent experiment took advantage of the unique characteristics of gas-filled hollow-core photonic crystal fiber (HC-PCF) [4] for reaching the coherent interaction regime of BSRS [5]. It has been shown that well before the pulse reaches its asymptotic from in Eq. (1), the amplification process saturates due to formation of a stable, soliton-like pulse. This pulse emerges as a result of the combined action of nonlinear amplification at the pulse leading edge and nonlinear absorption at its trailing edge (a direct consequence of the coherent nature of the interaction). In this report, we propose an asymptotic self-similarity approximation solution for coherent BSRS interaction regime. Interestingly, it shows that the ensemble train of solitary pulse train is possibly formed. This result can be considered as the formation of further solitary pulses observed previously.

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B-28

SPECTROSCOPIC INVESTIGATIONS ON THE STRUCTURE AND OPTICAL PROPERTIES OF TIN-SILICA GLASS CERAMIC MONOLITHS DOPED WITH Eu^{3+} IONS

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Abstract.

Silica-based nanostructured glass ceramics are of great interest due to their applications towards various photonic devices. The production of active rare earth (RE) species in a glass matrix can give rise to high luminescence efficiency, if one can avoid clustering of and energy exchange between the RE ions. The use of glass ceramics offers an ideal solution as this class of materials combines the mechanical and optical properties of the glass with a crystal-like environment for the RE ions, thus eliminating the cluster effects.

In the present work, SiO_2 – SnO_2 systems have been chosen as the glass-ceramic because the semiconductor nanoclusters of SnO_2 can also be used to transfer energy to RE ions. In effect, by doping the RE ions into the semiconductor nanoclusters, then band gap excitation may result in efficient energy transfer thus yielding intense luminescence from the RE ions [1,2]. This work presents recent results obtained for high-Sn content bulk systems. All syntheses are based on sol-gel techniques and the samples are activated by rare-earth ions (Eu^{+3}). The average size of SnO_2 crystal estimated from XRD and TEM data was to be around 5 nm. Moreover, the nanocrystal size seems to be controlled by the pore size of the gel. Photoluminescence and photoluminescence excitation show that the doped RE ions are indeed located within the SnO_2 crystals and the nanoparticles can transfer energies for Eu^{3+} ions.

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B-29

SPECTRAL STUDIES OF Dy AND Ce IONS DOPED IN THE ALKALI BORATE GLASSES

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Abstract.

Optical spectroscopy of Dy and Ce ions doped in the alkali metal borate glasses (70-x-y)B_2O_3.15Li_2CO_3.15Na_2CO_3.xDy_2O_3.yCeO_2 (BLiNa: Dy,Ce) fabricated by melting method have been studied. The parameters of spectral intensities of f - f transition determined using the Judd - Ofelt theory allows determination of asymmetric links between RE^{3+} and O^{2-}, and polarization in this materia. Energy transfer from the absorption and fluorescence center has been discussed. The cross-relaxation mechanism is also discussed for BLiNa glass.

Keywords: *Dy and Ce ions doped; alkali metal borate glasses.*

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B-30

DEVELOPMENT OF A RAMAN LIDAR SYSTEM FOR STUDYING THE ATMOSPHERIC HUMIDITY

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Abstract.

Humidity is a key parameter in studying atmosphere. We have developed a Raman lidar system to probe the atmospheric humidity profile. The lidar system consist of two channels, one channel receives the Raman backscattering signal of water vapor molecule and another channel receivers the Raman backscattering of nitrogen molecule in atmosphere. The atmospheric water vapor mixing ratio (specific humidity) profile can be derived from above two Raman backscattering intensity profiles. Then, the relative humidity profile can deduce from the water vapor mixing ratio by using the saturation vapor pressure value from Magnus fomula. In this paper, we describe the design, characteristic and main parameters of this Raman lidar system. We also present test measurements of the Raman lidar in Hanoi to examine operation of the lidar system.

Keyword: *Raman lidar, atmospheric humidity, atmospheric water mixing vapor ratio*

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B-31

A STUDY OF Co ABSORPTION ON ANATASE TiO_2 (001) SURFACE

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Abstract.

First principles density functional theory (DFT) calculations have been performed on the structural and electronic properties of anatase (001) TiO_2 surface. The adsorption and diffusion of CO on modified TiO_2 anatase (001) surface have been studied by using DFT. We have considered three different adsorption sites for CO on modified TiO_2 anatase (001) surface, and the transitions between them were discussed. Our calculations show that CO prefers to be adsorbed perpendicular to the surface with C atom oriented toward to the surface.

Analysis of electronic structure reveals that there is a small amount of charge transfer from CO to TiO_2 anatase (001). The simulation of migration of CO on TiO_2 (001) surface indicate that CO can easily diffuse on TiO_2 with small barrier energy (approximately 130 meV).

Keywords. *density functional theory, adsorption, electronic structure.*

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B-32

USING SPECTROSCOPY TO STUDY OF OPTICAL PROPERTIES OF PHOTOANODES FILMS FTO/TiO_2/CdS/CdSe/ZnS FOR QUANTUM DOTS SOLAR CELL

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Abstract.

Quantum dots (QDs) ensitized nanocrystalline TiO_2 solarcells (QDSCs) are promising third-generation photovoltaic devices. Due to the tunable bandgap, the CBs of QDs can match the CB of TiO_2 and thereby ensure effective electron transfer from QDs to TiO_2. And QDs give a high theoretical efficiency for QDSCs because of their multiple-exciton effect. Moreover QDs have a better photochemical stability compared to organic dye [1]. In this study Qds CdSe have been prepared via a colloidal with an organic ligand layer trioctylphosphine (TOP) and Oleic acid as a capping agent, Anode photoelectrode was prepared CdS/CdSe QDs/ZnS thin films deposition on TiO_2 electrode by successive ionic layer adsorption and reaction method (SILAR). The structural of materials the ZnS/CdSeQds/CdS/TiO_2, optical properties and electric characteristics of Anode ZnS/CdSeQDs/CdS//TiO_2 thin films was investigated by optical spectrum (micro Raman, photoluminescence, UV-Viss and photocurrent. Results show a wider photoresponse range of TiO_2 mesopores from the ultraviolet region to the visible light region. Sequentially assembled CdS/CdSe/ZnS quantum dots exhibit significantly improved light-harvesting ability and photocurrent efficiency.

Keywords: *Quantum dot sensitized solar cells, Raman, Photoluminescence*

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B-33

OPTICAL PROPERTIES OF Dy^{3+} IONS IN ALKALI METAL BORATE GLASSES GLASS

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Abstract.

Dyposium doped alkali metal borate glass (69,5B_2O_3-15Na_2O-15Li_2O-BNaLi) with difference concentration were prepared by the conventional melting procedure. Optical absorption, excitation, luminescence spectra and lifetime have been measured at room temperature. Judd – Ofelt (JO) theory is used to study the spectral properties and to calculate the radiative transition probabilities. The prediced branching ratios (β_R), radiative lifetime (ι_R), integrated emission cross – section (Σ_{if}) and stimulated emission cross – sections ($\sigma(\lambda_p)$) of the ${}^4G_{5/2}$ excited level are reported.

Keywords: *alkali metal borate glass.*

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B-34

INVESTIGATING CHARACTERISTICS OF INORGANIC – ORGANIC HETEROGENEOUS STRUCTURE FOR HYBRID SOLAR CELL

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Abstract.

In this study, we fabricated and investigated characteristics of organic - inorganic hetero-structure in hybrid solar cell. The simple thin film P3HT:PCBM/glass was fabricated by spin coating and the ZnO nanorods were synthesized by two-step electrochemically steady current method on ITO/ZnO seed. The result showed P3HT:PCBM have the high photon absorption in the visible light wavelengths with three characteristic peaks at of 515 nm, 555 nm and 610 nm, the uniform growth of nanorods which have a homogeneous and good orientation in demonstrating the hexagonal structure. The ITO/ZnO seed/ZnO nanorod/P3HT:PCBM heterogeneous structure have showed interconnecting hybrid organic-inorganic. Comparing with P3HT:P3HT/glass the peak of absorption of this structure shifts to blue but it retain high crystallization.

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B-35

SYNTHESIS AND OPTICAL PROPERTIES OF CdSe /CdS QUANTUM DOTS – BASED FLUORESCENCE SILICA NANOPARTICLES (CdSe/CdS@SiO_2) BY A GREEN ROUTE

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Abstract.

This work presents the synthesis and optical properties of CdSe/CdS quantum dots-based fluorescence silica nanoparticles by a green route. The CdSe/CdS quantum dots dispersed in water have been synthesized via wet chemical method using citrate as surfactant agent. The CdSe/CdS quantum dots then have coated by silica layer using modified Stöber method. We used tetraethylorthosilicate (TEOS) and aminopropyltriethoxysilane (APTEOS) as precursors, and ammonium hydroxide and sodium hydroxide as catalysts. The prepared CdSe/CdS@SiO_2 nanoparticles are quite mono-dispersed in the water. The size of SiO_2 nanoparticles is estimated to be 80 to 150 nm depending on synthesis conditions. The emission intensity of SiO_2 nanoparticles is stronger than that of uncoated CdSe/CdS quantum dots. The CdSe/CdS quantum dots-based fluorescence silica nanoparticles exhibit a photostability for a long time of storing. The results show an ability to use the SiO_2 nanoparticles as biomarkers.

Keywords: *Fluorescence silica nanoparticles, CdSe/CdS quantum dots, green route, photostability.*

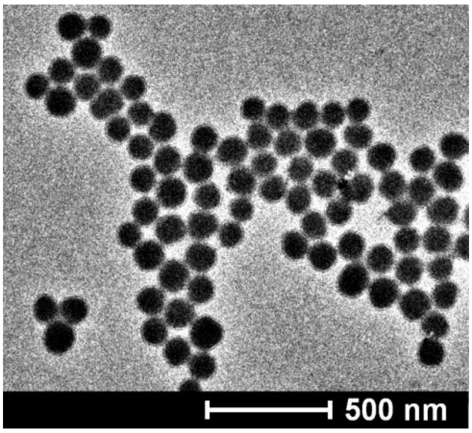

Fig 1. *TEM image of CdSe/CdS@SiO_2 nanoparticle.*

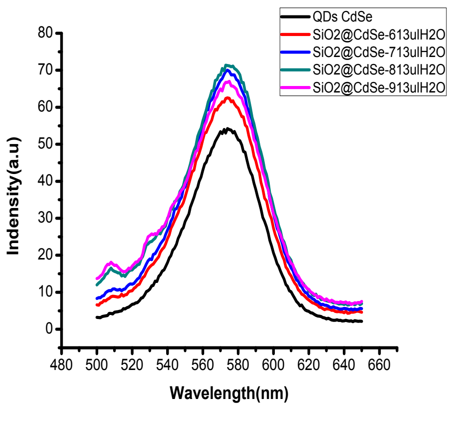

Fig 2. *Fluorescence spectra of CdSe/CdS@SiO_2 nanoparticle with different synthesis conditions.*

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B-36

ULTRASONIC SPRAY PYROLYSIS OF In_2S_3 BUFFER LAYERS FOR $Cu(In,Al)S_2$ SOLAR CELL

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Abstract.

We report the ultrasonically sprayed In_2S_3 buffer layers for $Cu(In,Al)S_2$ solar cells. The effects of [In]/[S] ratio on the physical properties of thin films were studied. The obtained results were used to study changes of the photovoltaic parameters of the solar cells. It is observed that thin films deposited from solution with [In]/[S] = 1/3 show the formation of In_2S_3 nanoparticles possessing tetragonal structure with an average particle diameter of 30nm. On the other hand, solar cells of $ZnO/In_2S_3/Cu(In,Al)S_2$ were also studied as a function of the In_2S_3 buffer deposition conditions. The maximum solar cell efficiency of 2.01% was achieved. Further process optimization is expected to lead to performance comparable to CdS buffers.

B-37

STRUCTURE AND OPTICAL PROPERTIES OF SPUTTERED CHROMIUM OXIDE THIN FILMS

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Abstract.

The 100 nm – CrO_x thin films were deposited on Si wafers and fluorine doped tin oxide (FTO) commercial substrates by d.c reactive magnetron sputtering technique from Cr metal target in gas mixture of Ar and O_2. The oxygen partial pressure was varied from 6% to 40% in total working pressure and the annealing temperature up to 500 ^oC. The FTIR analysis was revealed that the absorption band at 540 cm^{-1} was assigned to the Cr - O bond in Cr_2O_3 phase. However, the intensity of 540 cm^{-1} peak of the annealed CrO_x films was stronger than that of films without annealing. This indicated that there was the additionally oxidized to stoichiometric Cr_2O_3 through the heating process in air condition. In addition, the new bands at around 401 cm^{-1} and 613 cm^{-1} of the 300 ^0C and 500 ^oC annealed samples were characteristics for crystalline Cr_2O_3. The FESEM images of CrO_x films showed that as oxygen - to - argon ratio gradually increased from 6% to 40%, the surface morphology were more visible with less voids and clear grain boundaries. The absorption coefficient α evaluated from optical transmittance data and energy band gap E_g estimated by using the Tauc equation were meet with the structure features of films. The structures and optical properties of CrO_x thin films were found to be a function of experimental parameters.

This work was supported by the National Foundation for Science and Technology Development (NAFOSTED - 103.02-2012.50).

Keyword: *chromium oxide, microstructure, optical properties.*

B-38

CONTROLING OF THE OPTICAL PROPERTIES OF COLLOIDAL GRADIENTLY ALLOYED $Zn_xCd_{1-x}S$ NANOCRYSTALS BY MOLAR RATIOS Zn/Cd

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Abstract.

Bandgap engineering could be achieved via the control of the size and composition of semiconductor nanocrystals (NCs). Here we report the effect of molar ratios Zn/Cd on the optical properties of colloidal gradiently alloyed $Zn_xCd_{1-x}S$ NCs consisting of Cd-rich inner cores and Zn-rich outer shells. The $Zn_xCd_{1-x}S$ NCs have been synthesized at 280 ^oC using zinc stearate, cadmium oxide and sulfur as precursors and octadecene as the reaction medium. Their gradient-alloyed structure is supported by the characteristic X-ray diffraction pattern. A composition-tunable emission has been demonstrated by a systematic blue-shift in emission wavelength with increasing molar ratios Zn/Cd. The optical properties of ZnCdS NCs are discussed in relation to the Zn content and graded gap nanocrystal structure.

Keywords: *gradiently alloyed $Zn_xCd_{1-x}S$, graded gap nanocrystal structure, X-ray diffraction, absorption, photoluminescence.*

B-39

EFFECT OF THE a-Si:H PASSIVATION LAYER ON CRYSTALLINE-AMORPHOUS SILICON HETEROJUNCTION SOLAR CELLS

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Abstract.

In the structure of HIT solar cells, using a thin intrinsic amorphous silicon (i-a-Si:H) buffer layer between a doped thin film and a crystalline silicon wafer (c-Si) is essential to high efficiency solar cells. The high quality of intrinsic a-Si:H thin layers with low interfacial defect density, high optical band gap and higher hydrogen content is the key to obtaining good properties of passivation for the surface c-Si wafer. This way resulted in the high open circuit voltage (V_{OC}) of HIT solar cells. In this study, we report the properties of intrinsic a-Si:H passivation layers deposited using RF (13.56 MHz) PECVD, at different H_2/SiH_4 gas flow ratios (R_H), pressures and substrate temperatures. Trends relating deposition conditions to relevant film characteristics, such as thickness, hydrogen bonding, optical band gap and dark conductivity of the intrinsic thin films are discussed. Low series resistance and dramatically decreased dark conductivity when R_H increased ($2 \leq R_H \leq 5$), which showed that a good a-Si:H/c-Si interface and a good film quality. The results indicate that the hydrogen dilution ratios play a very important role in passivation process of the c-Si wafer surface which are important to achieve high efficiency HIT solar cells.

Keywords: *Hetero-junction with intrinsic thin film solar cells; hydrogenated intrinsic amorphous silicon (i-a-Si:H);radio frequency plasma enhance chemical vapor deposition (RF-PECVD); surface passivation; a-Si:H/c-Si interface;*

B-40

SURFACE ENHANCED RAMAN SCATTERING BY METAL NANOPARTICLES

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Abstract.

We studied to use metal nanoparticles for Surface Enhanced Raman Spectroscopy (SERS). Gold, silver and platinum nanoparticles were produced in liquids by laser ablation method. These metal nanoparticle colloids were used to prepare metal nanostructure substrates for SERS measurement. Raman spectra were measured by a Micro-Raman spectrophotometer (LABRAM HR). The enhanced Raman scattering of Rhodamin 6G and glucose molecules on the SERS substrates was obtained. The results and discussion will be reported in this paper.

Keywords: *Surface enhanced Raman scattering, laser ablation, Plasmon resonance.*

B-41

FITC DOPED SILICA NANOPARTICLES WITH DNA FOR BREAST CANCER CELL IMAGING

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Abstract.

This work describes the design, synthesis and biological application of dye-doped silica nanoparticles (DDSNs). About 70 nm size monodisperse FITC (fluorescein isothiocyanate) doped silica nanoparticles were synthesized using Stober method. The DDSN surface was then modified to attach amine and carboxyl functional groups or coated by streptavidin. To demonstrate bioimaging applications, the DDSNs were conjugated with the specific HER2 DNA aptamer (oligonucleic acid or peptide molecules that bind to a specific target molecule). DNA-conjugated DDSNs were treated with BT-474, HCT 116 and Hela cells. DNA-conjugated DDSNs were targeted to two types of cells, human breast cancer (BT-474) and human conlon cancer (HCT116) cells. Both types of cells over express HER2 receptors and as expected, an extensive labelling was observed with those cells when compared with Hela (cervical cancer) cells. Laser scanning confocal images clearly showed that DNA-conjugated DDSNs were internalized by BT-474 and HCT116 cells. Specially, immunofluorescence images denoted the uptake and distribution of DNA-conjugated DDSNs in BT-474 cell tumor sphere (3D). The results can be applied to study the penetration and effect of targeted nano-drug system on the multicellular sphere for drug screening.

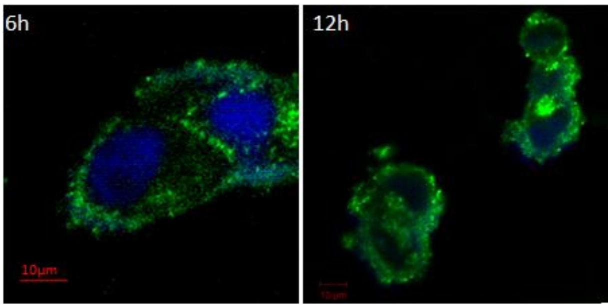

Fig. 1. *Fluorescence images of_BT-474 cells when incubated with DNA-conjugated DDSNs. The FITC green color show the location of nanoparticles not only concentrated in the membrane, but also around the cell nucleus region.*

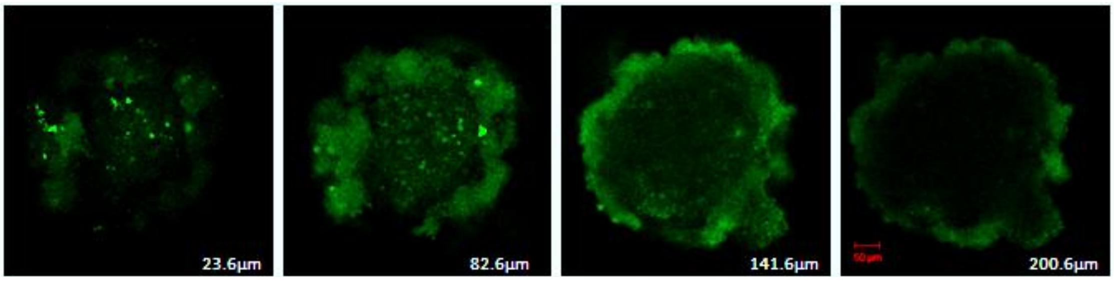

Fig. 2. *Fluorescent images of 3D sphere slices of BT-474 cell lines when incubated with DNA-conjugated DDSNs in 16h (corner numbers denote depth slices).*

B-42

RESEARCH A EFFICIENCY OF ERBIUM GLASS LASER PUMPED BY FLASH LAMP WITH THE ACTIVE MEDIUM IS YTTERBIUM-ERBIUM PHOSPHATE GLASS

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Abstract.

In my laboratory, there is a project to manufacture eye safety Laser. We used the active element is ytterbium-erbium phosphate glass for the active medium, erbium glass remains the most reliable, available and easy to-use laser material for creation of relatively eye-safe laser radiation in the spectral band near 1.54 µm. Research and optimize a efficiency of the output energy of laser pumped by flash lamp are considered. In this paper, we are presentation of some results we got.

Keywords: *eye safety lasser, Erbium glass laser.*

B-43

PHOTOLUMINESCENCE PROPERTIES OF $BaMgAl_{10}O_{17}$ DOPED Mn^{2+} FOR BLUE-LED BY COMBUSTION METHOD

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Abstract.

In most of host crystals, the Mn^{2+} transition from the $^6A_1$ ground state to the $^4T_2$ excited state is located at the blue light region. $BaMgAl_{10}O_{17}$: Mn^{2+} phosphor was prepared by combustion method. This phosphor exhibited green emission peak at 514 nm under excitation of 428 nm. The PL peak intensity reaches its maximum at Mn^{2+} = 11 mol %. From Tanabe-Sugano diagram for d^5 ions (Mn^{2+}), crystal field parameters B, C and Dq, which is base on crystal field theory were calculated.

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B-44

OPTICAL PROPERTIES OF Au NANOPARTICLES DISPERSED ON TiO_2 FILMS BY VACUUM EVAPORATION METHOD

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Abstract.

In our study a new and simple method was performed to prepare of gold nanoparticles dispersed on TiO_2 nanostructure films. Here a very thin Au layer was deposited on TiO_2 film by thermal evaporation then the samples was heated in air for 4 h at 400 C. The FE-SEM images of Au@TiO_2 film was shown that after annealed the Au atoms were concentrated to form Au nanoparticles and good dispersed on the surface of TiO_2 films. The average size of Au nanoparticles was found to be dependence on thickness of gold layer deposited and changing from 10 nm to 60 nm. The optical properties of Au@TiO_2 films were investigated by measuring ultraviolet-visible (Uv-Vis) absorption spectroscopy. The results shown that beyond of the absorbance of TiO_2 nanoparticle material there is strong another absorption peak related to plasmon resonance absorbance of gold nanoparticles with peak position change from 520 nm to 620 nm dependence of gold nanoparticle size.

B-45

PROPERTIES OF PbS NANOCRYSTALS PREPARED BY ELECTROCHEMICAL AND SONO-ELECTROCHEMICAL METHOD

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Abstract.

In this report, we studied some properties of PbS nanocrystals, prepared by sono-electrochemical and electrochemical methods from precursors of lead acetate - $Pb(CH_3COO)_2.3H_2O$, thioacetamide - CH_3CSNH_2 (TAA) and cetyltrimethyl ammonium bromide – $C_{19}H_{42}BrN$ (CTAB). The PbS nanocrystals were characterized by X-ray powder diffractometer (XRD), scanning electron microscope (SEM) and UV-Vis absorption spectroscopy. SEM images showed that PbS nanocrystals have rod shape with length and diameter of around 100 nm and 20 nm respectively. The as-prepared PbS nanocrystals were crystallized in face center cubic structure (FCC). The optical absorption spectra show a strong blue-shift of absorption edge due to the quantum size effect.

Keywords: *Nanocrystals, Lead sulfide, Sonochemical, Sonoelectrochemical methods.*

B-46

SETUP LASER – MICRO TOTAL ANALYSIS SYSTEM (µTAS) TO DETERMINE THE FLUORESCENT DYE CONCENTRATION IN SOLUTION

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Abstract.

There are various methods to filtrate out the fluorescence light from the excitation light in optical measurement in which the most effective method is using cross-polarized glasses. In this report, the laser micro total analysis system (µTAS) was built up to determine the fluorescent dye concentration in solution. This µTAS system includes four parts: the excitation laser source, the cross-polarized filter, the solution-tank and the optical detector. The violet laser (λ = 405 nm) is used for the excitation source and two cross-polarized glasses are used for filtrating the excitation light. The solution-tank is placed between two cross-polarized glasses. The Silicon photo-diode is used for optical detector connected to "Lock-in amplifier SR510". The modulation signal with frequency 5 Hz was used for modulating the excitation light and referencing to Lock-in Amplifier. The limit of detection (LOD) is down to 10 nM of AlQ_3 conducting polymer in alcohol based on the calculation of the received "Lock-in amplifier SR510" data. From this result, the homemade µTAS combine with micro-fluidic chip can be applied in portable-fast diagnostic tools in next step.

Keywords: *µTAS, Microfluidic chip.*

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B-47

SYNTHESIS OF TiO_2-SiO_2 POWDER BY SOL-GEL METHOD

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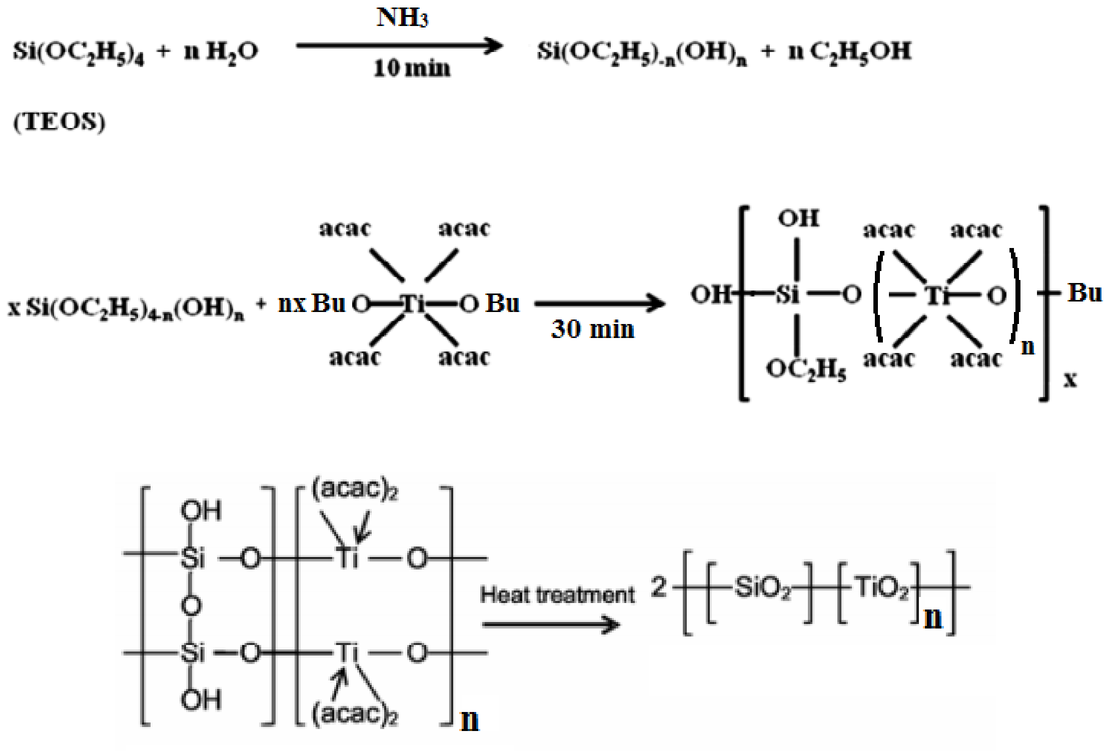
Abstract.

Binary metal oxide TiO_2-SiO_2 powder has been synthesized via sol-gel method using tetrabuthyl orthotitanate and tetraethyl orthosilicate compound as the titanium and silicon precursors respectively (Scheme 1). The physico-chemical properties of the TiO_2-SiO_2 powder are characterized using thermal effect, X-ray diffraction (XRD) and Scanning Electron Microscope (SEM). XRD analysis shows that the TiO_2-SiO_2 powder is in anatase structure after calcination at 600 ^oC. The SEM pictures show that the TiO_2-SiO_2 particles are nano-sized spheres. The photocatalytic properties have been evaluated by studies on the degradation of methylene blue.



Scheme 1.

B-48

MEASURING LUMINESCENCE FROM SINGLE NANOPARTICLES IN A CONFOCAL SETUP COMBINED WITH A COMPACT 2D NANOPOSITIONING STAGE

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Abstract.

Optical study of single nanoparticles has become a very powerful way to characterize the physical properties and interaction at nanometer level. In our laboratory we have setup a confocal excitation and detection system to detect the luminescence from single nanoparticles such as quantum dots or dye-doped silica nanoparticles. The particles are excited by either a cw Nd:YAG laser or a picosecond pulsed diode laser and the luminescence is collected using a high numerical aperture objective and detected by photon counting detectors. A compact 2D nanopositioning stage allows the nanoparticles to be scanned with nanometer accuracy. The stage is based on monolithic flexure mechanism and fabricated from aluminum alloy using wire electrical discharge machining. The stage is actuated by two piezoelectric actuators and its position is accurately determined in real-time with integrated capacitive and strain-gage sensors. We present and discuss some initial measurements of luminescence from single quantum dots using our optical setup.

B-49

INVESTIGATING ELECTRICAL AND OPTICAL PROPERTIES OF Sb-DOPED ZnO THIN FILMS FARICATED BY SOLGEL SPIN-COATING METHOD

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Abstract.

Undoped and doped ZnO thin films were prepared by sol–gel method and deposited on glass substrate by using solgel spin-coating technique. ZnO films were doped with various Sb concentrations. It is supposed that Sb preferentially occupied Zn sites. The starting material was zinc acetate dehydrate. In addition, 2-methoxyethanol was used as solvent and monoethanolamine (MEA) as stabilizer. The effects of Sb dopants on the structural, optical, and electrical properties of ZnO films are investigated by XRD, UV-VIS spectrophotometer, PL spectra. The results of the XRD and UV-VIS indicate that each of all the films maintain the wurtzite ZnO structure and possess a preferred orientation along the c axis, with high transmittance (> 80%) in the visible range. Hall effect measurements illustrated electrical conductivity and carrier concentration of Sb-doped ZnO thin films.

Keywords: *Sb-doped ZnO thin films, sol–gel spin-coating method, structure, wurtzite, electrical conductivity, carrier concentration.*

KHẢO SÁT TÍNH CHẤT ĐIỆN VÀ QUANG CỦA MÀNG ZnO PHA TẠP ANTIMONY ĐƯỢC TỔNG HỢP BẰNG PHƯƠNG PHÁP SOL-GEL PHỦ QUAY

Tóm tắt.

Phương pháp sol-gel kết hợp với phương pháp phủ quay được sử dụng để tổng hợp màng ZnO pha tạp và không pha tạp antimony (Sb) trên đế thạch anh. Màng ZnO được pha tạp với những nồng độ khác nhau của Sb. Các kết quả nghiên cứu cho thấy rằng Sb được ưu tiên chiếm vị trí của Zn trong mạng tinh thể ZnO. Vật liệu nền được sử dụng là zinc acetate dehydrate. Bên cạnh đó, 2-methoxyethanol đóng vai trò như là dung môi và monoethanolamine (MEA) là chất ổn định. Ảnh hưởng của tạp chất Sb lên cấu trúc, tính chất điện và quang của màng ZnO được khảo sát bằng phổ XRD, UV-VIS, và phổ PL. Kết quả của phổ XRD và phổ UV-VIS chỉ ra rằng tất cả mẫu khảo sát đều vẫn giữ được cấu trúc wurtzite của mạng tinh thể ZnO và được ưu tiên định hướng theo trục c, với độ truyền qua cao trong vùng nhìn thấy (>80%). Hiệu ứng Hall chỉ ra độ dẫn và nồng độ hạt tải của màng ZnO pha tạp Sb.

Từ khóa: *Màng ZnO pha tạp Sb, phương pháp solgel phủ quay, wurtzite, độ dẫn, nồng độ hạt tải.*

C-01

LASER RAMAN MICRO-SPECTROSCOPY & CANCER RESEARCHES

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Elected member of the New-York Academy of Sciences, USA

Abstract.

Powerful modern analytical methods must be used for the advancement of cancer studies. The pollution in foods and industrial products, the leeks of radioactivity from nuclear plants, the presence of dangerous nanoparticles, issued from terrestrial and areal transportations and volcanic eruptions due to the seisms of tectonic layers, more and more frequent on the surface of the world are among the main causes of human diseases, especially cancer.

Systematic investigation with Laser Raman micro-spectroscopy can help to diagnose cancer desease end leads to detect the mechanism of certain carcenogeneses. In correlation, the identification of carcenogen substances to be avoided is possible. It also opens the way to find new anti-cancer drugs from nature as well as from syntheses.

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C-02

COMBINING MULTI-SHOT AND SINGLE SHOT AUTOCORRELATION FOR ULTRASHORT LASER PULSE WIDTH MEASUREMENT

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Abstract.

Pulse width of femtosecond laser Tsunami (Spectra Physics) was measured using a combined method of classical multi-shot and single shot autocorrelation techniques. The autocorrelation function is derived based on second harmonic (SH) generation of two 800 nm laser beams crossing inside a BBO crystal. The measurement involves a simultaneous single shot image of the SH beam and an intensity autocorrelation of the beam with varied time delays of one pump beam. We used a CCD camera for recording the SH beam image. The laser pulse width is computed based on the SH beam profile and the crossing angle of the two incident beams. In parallel, by integrating signal of each pixel over the entire image of the SH beam we get the beam intensity, thus retrieving multi-shot autocorrelation function for different time delays of pump beam. The two techniques yield similar pulse widths. These values are also in agreement with the one derived from the spectral band width. The SH beam positions and spatial widths along time delay are presented and discussed.

C-03

DESIGN AND REALIZATION OF HIGH POWER MULTI-WAVELENGTH LED EQUIPMENT USING FOR BEAUTY CARE AND DERMATOLOGICAL TREATMENTS

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Abstract.

Light therapy is quickly becoming a favorite tool of medical and non-medical skincare professionals. It is quick, painless, highly effective, and requires very little operator intervention, which makes it a very profitable procedure. The light provided by a high intensity, multi-frequency light-emitting diode (LED) can be effectively used to treat a variety of issues from fine lines and wrinkles to acne, sun damage, scars, and cellulite. The LEDs do not deliver high heat energy to injure, destroy or burn specific skin tissues or chromophores, but rather the skin cells are stimulated by absorbing specific wavelength energies to begin the rejuvenation process [1,2].

In this report, we present design and realization of Photodynamic Therapy (PDT) system with large area irradiation, arc design of the lighting head suitable for the character of face and back and some other part of body. Four wavelengths of high-power LEDs: red (630 nm), yellow (590 nm), green (520 nm), blue (430 nm) are intergrated in the panel 40 x 40 cm. The optical design was used lens matrix to eliminate the large devegence of individual LEDs. The radiation density reachs above 50 mW/cm^2 at the surface of the lighting head. In the equipment, the microprocessor technique was employed for controlling of whole system by an frienly interface to users. We can operate the output light in continuous or pulse (upto 100Hz) modes as well as activate the timer to control radiation dose. These functions allow medical experts to choose an efficient treatment regime. The PDT system is multi working function equipment and can apply for many treatments in dermatology and beauty care.

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C-04

OPTIMIZATION OF DEPOSITION CONDITIONS OF CiS THIN FILMS USING RESPONSE SURFACE METHODOLOGY

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Abstract.

Copper indium di sulfide ($CuInS_2$-CIS) thin films were prepared on glass substrates by ultrasonic spray pyrolysis deposition (USPD) technique under different temperature substrate, molar ratio [Cu]/[In] and [S]/[Cu] in solution precursors and stirring speed. Response Surface Methodology (RSM) and Central Composite Design (CCD) were used to optimization of deposition parameters of the CIS thin films. RSM and CCD were also used to understand the significance and interaction of the factors affecting the film quality. Variables were determined as temperature substrate, molar ratio [Cu]/[In] and [S]/ [Cu] in solution precursors. The band gap was chosen as response in the study. Influences of the variables on the band gap and the film quality were investigated. 5-level-3-factor central composite design was employed to evaluate the effects of the deposition conditions parameters such as temperature substrate (Ts=320 - 420 ^{o}C), [Cu]/[In]=0.85-1.4 and [S]/ [Cu]=3-6 on the band gap of the films. The samples were characterized using X-ray diffraction (XRD), Raman, scanning electron microscope (SEM) and ultraviolet–visible spectroscopy (UV–vis) measurements. The optimal conditions for the deposition parameters of the CIS thin films have been found to be: Ts=360 ^{o}C, [Cu]/[In] = 1.1 and [S]/[Cu] = 5.0. Under the optimal conditions theoretical (predicted) band gap of CIS (1.45 eV) was calculated using optimal coded values from the model and the theoretical value is a good agreement with the value (1.46 eV) obtained by verification experiment.

C-05

EFFECTIVE VISIBLE-LIGHT PHOTOCATALYTS OF CARBON NANOTUBES COATED BY TITANIUM NANOPARTICLES

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Abstract.

The visible-light photocatalystof multiwalled carbon nanotubes coated by titanium nanoparticles (TiO_2/MWCNTs) was successfully prepared by hydrolysis method with various initial tetra-isopropoxide and MWCNTs contents. These composite photocatalysts were characterized by XRD, FTIR, SEM, and UV-vis diffusive reflectance techniques. Their photocatalytic activities were tested through decomposition reaction of methylene blue (MB) and methylene orange (MO) as model organic compounds. It was indicated that the TiO_2 particlesin average diameter of 20 nm coated on carbon tube surface wereonly crystallized inanatase phase. The FTIR and SEM results showed the presence of contact layer and bonds between TiO_2 particles and carbon nanotubes.In comparison with TiO_2 pure, the obtained composite was able to absorb a higher amount of photo in the visible - light range and performed a significantly enhanced photo degradation rate. The possible photocatalytic mechanisms of the resulting composite were discussed in two aspects of electron transportation and adsorption.

Keywords: *TiO_2, MWCNTs, photocatalyst, composite.*

C-06

BACTERICIDAL EFFECT OF LOW LEVEL SEMICONDUCTOR LASER WITH *ENTEROCOCCUS FAECALIS* IN THE INFECTED ROOT CANALS IN CARIES: IN VITRO STUDY

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Abstract.

The exist of bacteria in the root canal system lead to endodontics failures. The success of endodontic treatment depends on the complete elimination of microorganisms from the infected root canal system and dentinal tubules in caries. *Enterococcus faecalis* (*E.faecalis)* is main reason causing unsuccessful endodontic treatment. *E.faecalis* is one of the most common bacteria in persistent root canals infections [1, 2]. *E.faecalis* is frequently recovered from the root canals of infected teeth associated with post-treatment diseases [3].

The aim of this study was to investigate the bactericidal effect of two different types low level semiconductor laser (LLSL) with *E.faecalis* in the infected root canal system. *E.faecalis* was stored in 0.9% NaCl solution. Each of the experimental specimens has 35 ml solution of a suspension containing about 10^7 colony forming units per milliliter (CFU/ml). Nine specimens were divided into three groups. Group 1- laser tested group (three specimens) was irradiated with 940nm LLSL, power output 10 mW, frequency of 70 Hz, continuous wave mode. Group 2- laser tested group (three specimens) was irradiated simultaneously with 780 nm and 940 nm LLSL, power output 16 mW, frequency of 70 Hz, continuous wave mode. Group 3- control group (three specimens) was not irradiated with LLSL. Each of the specimens was exposed three times, the laser irradiation time was twenty minutes each, at interval of six hours. Bacterial samples were taken before and after laser irradiation. It was taken 3 times, the each of taking contains 1 ml *E.faecalis* solution, decimal dilutions were made to allow the number of CFU to be determined. From the appropriate dilutions was cultivated 0.2 ml on a Petri with a sterile brain heart infusion (BHI) solution, incubated at 37°C for 24h. The number of CFU was counted on all plates. The results were quoted in "log kills" in accordance with the work of Rooney *et al* [4]. The number of *E.faecalis* decrease in CFU was 96.74% in group 1 ($p<0.05$), was 96.49% in group 2 ($p<0.05$) after 3 times laser irradiation. The results showed a high bactericidal reduction in two groups irradiated with LLSL.

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C-07

COMPACT ELECTROMECHANICAL TUNABLE MICRO-RING RESONATOR ADD-DROP FILTER

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Abstract.

With recent advantages in the fabrication technology, silicon microring resonator filters with miniaturized size has been realized for high density integrated photonic circuits [1]. The ring with miniature size is required to obtain a large free-spectral-range resonant filter. Moreover, for wavelength tuning and center wavelength trimming in a defined optical channel spacing, tunable optical filter is requisite to develop. A few of mechanisms for making the tunable micro-ring resonator have been reported such as electro-optic and thermo-optic [2-3]. In this paper, we propose a compact tunable add-drop microring resonator filter. The microring consists of fixed and movable freestanding submicron single-mode waveguides, which are coupled with each other through two directional couplers. The waveguides are 320 nm wide and 260 nm thick. The circumference of microring is 19 µm, which is verified by translating the movable waveguide by a comb actuator. The gap between the two couplers is kept to be a constant of 200 nm. The free-spectral-range at the telecommunication wavelength of 1.55 µm is 20 nm. The resonant wavelength of the microring is varied by 27 nm at the applied voltage of 25 V with negligible power consumption. The footprint of device is less than 2×10^{-4} mm^2. The proposed device is suitable for density integrated optical signal processing such as wavelength filtering and routing.

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C-08

RESEARCH IN THE APPLICATION OF LOW POWER SEMICONDUCTOR LASER IN TREATMENT ATHEROMAS OF CAROTID ARTERY

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Abstract.

In the carotid artery narrowed by atheromas is one of the important causes causing cerebral vascular accident in cerebral infarction and transient anencephalohemia. Transient anencephalohemia is a cerebral vascular accident warning signal can happen in the future. When treating cerebral vascular accident in cerebral infarction, at first we treat atheromas in the carotid artery. When atheromas clog inside carotid artery, the patients must be coronary bypass surgery (a). When inside carotid artery narrowed more in level (70 – 99%), these patients must be vascular endothellum stripping surgery (b). If the carotid artery narrowed in level (50 – 69%), the patients can be designated endothellum stripping surgery (c). When carotid artery narrowed in level < 50%, the patients were treated antiglomerule [aspirin (81 – 325 mg/a day, clopidogrel (75 mg/a day))] (d). In cases of a, b, c were taken in big hospitals that both all of modern equipments and good skills' doctors. In case of d must be note side – effects.

C-09

GEOMETRY OPTIMIZATION OF HEAT SINK FOR HEAT DISSIPATION OF THE COB LEDs BY CFD THERMAL SIMULATION

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Abstract.

The current paper introduces an effective numerical technique for geometric optimization of heat sink for heat dissipation of chip-on-board (COB) light-emitting diodes (LEDs) using computational fluid dynamic simulation (CFD). The heat generation in COB LEDs was substituted for the constant heat flux on the bottom surface of the chip, and it is consistent with power input of COB LEDs. Heat should dissipate through only surface between a heat source and a heat sink. Initially, in order to get the optimal working temperature, the total luminous flux of COB LEDs are measured by using an integrating sphere system (VMI-PR-001) with various temperature on the top surface of heat sink. An then, based on the given specifications, a conceptual model was developed using AUTOCAD program. Later on, the inner volume of this model was developed using GAMBIT software. Then after, the simulation of the volume of heat sink was done using ANSYS FLUENT, followed by its optimization. The effect of heat sink design was considered. When calculating the thermal dissipation, we used the maximum temperature on the top surface at the center of heat sink about 55^{o}C to optimize the geometry of heat sink. Testing of the prototype is carried out for the validation of simulated results. The results obtained from test are compared with the simulated results and found to be similar to each other.

Keywords: *COB LEDs measurement, integrating sphere, luminous flux, $BaSO_4$, computational fluid dynamic simulation, temperature, thermal dissipation.*

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C-10

PREPARATION OF SiO_2-COATED CdTe QUANTUM DOTS

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Abstract.

This work presents the synthesis of SiO_2 coated CdTe quantum dots (CdTe@SiO_2 nanoparticles) by using modified Stöber method. We used tetraethylorthosilicate (TEOS) and aminopropyltriethoxysilane (APTEOS) as precursors, and ammonium hydroxide and sodium hydroxide as catalysts. The size of CdTe@SiO_2 nanoparticles is estimated approximately 70 to 150 nm depending on the quantities of H_2O, APTEOS, and catalysts. Although most of prepared CdTe@SiO_2 nanoparticles have lower fluorescence intensity than uncoated quantum dots, the CdTe@SiO_2 nanoparticles have a photostability in different pH value of environments. The results show an ability to use the CdTe@SiO_2 nanoparticles for biological application.

Keywords: *Stöber method, fluorescence SiO_2 nanoparticles, CdTe quantum dots, aminopropyltriethoxysilane precursor, ammonium hydroxide catalysts.*

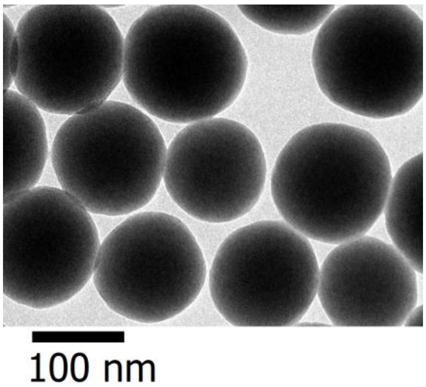

Fig 1. *TEM image of CdTe@SiO_2 nanoparticle.*

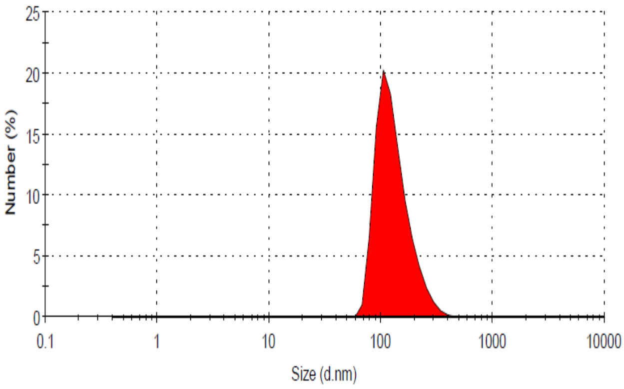

Fig 2. *Size distribution of prepared CdTe@SiO_2 nanoparticle.*

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C-11

SYNTHESIS AND OPTICAL PROPERTIES OF Eu-DOPED $Sr_6B_5PO_{20}$ PHOSPHOR POWDERS PREPARED VIA CO-PRECIPITATION METHOD FOR PRODUCING WHITE LIGHT FLUORESCENT LAMPS

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Abstract.

The Eu-doped $Sr_6B_5PO_{20}$ phosphor powders have been synthesized via co-precipitation method and subsequent reduction of the dopants in N_2/H_2 gas for tri-color compact fluorescent lamps application in industry. The phosphor powders have prepared with different concentrations of Eu ions. This co-precipitation method is advantage to make the phosphor powders with uniform particle size and quite high purity samples. The samples have been annealed from 600 to 1300 ^{0}C. The average particle size of the phosphor powder was in the range of 100 nm to 1 μm. It has been found out that typical phases of $Sr_6P_5BO_{20}$, $Sr_2P_2O_7$, $Sr_3P_2O_8$, and $Sr_3Eu(PO_4)_3$ co-existed in the as-prepared powders. The strong red emission intensity from 570 to 700 nm in photoluminescence spectra of $Sr_6B_5PO_{20}$:Eu^{3+} powders are attributed to the $^5D_0 \rightarrow {}^7F_j$ transitions of Eu^{3+} ion (where j gets the values of 1 to 6). The luminescence emission peaks of $Sr_6B_5PO_{20}$:Eu^{2+} powders in the range of 400 to 500 nm are attributed to the *5d-4f* transitions of Eu^{2+} ion. The as-prepared phosphor powders would be promising components for producing white light fluorescent lamps with using the same host material.

Keywords: *Eu doped $Sr_6B_5PO_{20}$, phosphor powder, co-precipitation method, fluorescent lamp.*

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C-12

DETERMINATION OF HIGH POWER DFB DIODE LASER PARAMETERS BASE ON AMPLIFIED SPONTANEOUS EMISSION SPECTRUM

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Abstract.

It is well known that the performance of distributed feedback (DFB) diode lasers is sensitive to parameters that determine the optical properties of the laser cavity, e.g., the coupling coefficient and Bragg wavelength of the grating, the waveguide losses, the group velocity and the magnitude and exact positions of the reflections from the end facets. It is desirable to measure the values of these parameters of manufactured lasers to evaluate and align the manufacturing process and also at an early stage discard components that are unlikely to fulfill the specification [1]. However, these parameters are usually difficult to access directly from laser spectra. To overcome this problem, determination of the amplified spontaneous emission spectrum (ASE), which contains important information about fundamental parameters of DFB lasers, is considered as alternative solution [1]-[4]. From the ASE spectra, the above parameters can be estimated. In this report, we firstly explain the ASE spectrum of individual 780 nm DFB diode lasers, and secondly describe the procedure used to extract some parameters from the ASE spectra.

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C-13

SIGNIFICANT ENHANCEMENT OF ROOM-TEMPERATURE LIGHT EMISSION IN Ge/Si EPILAYERS WITH APPLICATION OF TENSILE STRAIN AND HEAVY N-DOPING

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Abstract.

In recent years, tensile-strained and *n*-doped Ge has emerged as a potential candidate for the realization of optoelectronic devices that are compatible with the mainstream silicon technology. Compared to Si, pure Ge displays unique optical properties, the direct (Γ) valley of its conduction band is only 140 meV above the indirect (L) valleys at room temperature while it is larger than 2000 meV in Si. It has been shown that under application of a tensile strain, the Ge direct bandgap reduces faster than the indirect one and with a tensile strain of ∼1.9%, Ge can become a direct bandgap semiconductor [1]. On the other hand, *n*-type doping in Ge leads to a more efficient population of the zone center Γ valley and thus enhances radiative recombination at the Γ valley [2]. A judicious combination between tensile strain and *n*-doping may allow to get a Ge direct bandgap emission at a wavelength of 1550 nm required for telecommunications.

In this work, we report on Ge growth on Si(001) using molecular-beam epitaxy (MBE). Since Ge has a thermal expansion coefficient twice larger than that of Si, tensile strain can be induced in Ge when growing at high temperatures and subsequent cooling down to room temperature. The growth was carried out using a two-step procedure. Concerning the growth of the first Ge layer, we have evidenced the existence of a narrow substrate-temperature window, from 260 to 300 °C, in which the Stranski-Krastanov growth of Ge on Si can be suppressed. By combining growth at high temperatures with cyclic annealing we show that a tensile strain of 0.30 % can be obtained, which represents the highest value ever reported in the Ge/Si system [3].

Heavy n-type doping in Ge is a challenge due to a low solubility and a fast diffusivity of dopants. We implemented a specific doping cell based on GaP decomposition to produce P_2 molecules, which has a sticking coefficient of 10 times larger than that of tetrahedral white phosphorus [4]. In addition, we have developed an *in-situ* co-doping approach using P and Sb and obtained an activated electron concentration up to $4x10^{19}$ at.cm^{-3}. It is worth noting that such a high electron concentration cannot be achieved by one-run doping process in CVD. Finally, photoluminescence (PL) measurements carried out at room temperature revealed an enhancement of the PL intensity up to a factor larger than 150 times as compared to undoped samples.

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C-14

DETERMINATION OF KINETIC PARAMETERS OF KYF_4:Sm

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Abstract.

In the present paper, thermoluminescence study of KYF_4:Sm is reported. A polycrystalline sample of KYF_4:Sm was prepared by hydrothermal method. Formation of compound was confimed by talking the X-ray diffraction (XRD) pattern. TL glow curves of KYF_4:Sm have been after β-ray, γ-ray, X-ray, neutron irradiation. TL kinetic parameters of glow peak (with β-ray) have been calculated by analyzing of the heating rate method.

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C-15

FABRICATION OF SILVER NANOPARTICLE SET ON SILICON SURFACE FOR USING AS SURFACE-ENHANCED RAMAN SCATTERING ACTIVE SUBSTRATE

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Abstract.

Surface-enhanced Raman scattering (SERS) is a modern analytical technique that is increasingly being used to detect the trace amounts of organic and biological molecules in the analyzed samples. The detection limit of SERS technique depends mainly on the nature of the substrate which has been used to perform SERS measurements. In this report we present the fabrication of a set of silver nanoparticles on the surface of crystalline silicon, which in the next step was used as a SERS-active substrate (the substrate can be abbreviated as AgNPs @Si). The silver nanoparticles were deposited on the silicon surface by chemical deposition method. We have changed the fabrication parameters to achieve a set of silver nanoparticles with morphology, size and density optimized for SERS measurements. In the optimized conditions, with malachite green (MG) molecules used as testing probe, we have found that the AgNPs @Si substrate can detect the MG concentration as low as 10^{-9} M.

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C-16

COUPLING ANALYSIS BETWEEN ASYMMETRICAL OPTICAL WAVEGUIDES

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Abstract.

Coupling between symmetrical optical waveguides has been substantially investigated and applied for making optical components such as modulators, switches, filters, and multiplexers [1-5]. Coupling studies between optical waveguides are usually for improving power coupling efficiency. With need of developing optical communication networks, the monolithic integration of optical functions on a chip is requisite to develop. Optical devices in a layer or between layers are not only coupling but also isolating with each other. In this paper we will present coupling analysis between asymmetrical optical waveguides, in which waveguides with difference in shape, dimensions and refractive index are focused to investigate. Coupling analysis between optical modes in waveguides is presented in detail. This study emphasizes on possibility of optical isolation between neighbouring functional components in monolithic integrated optics circuits.

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C-17

MULTI-WAVELENGTH INVESTIGATION OF DIODE END-PUMPED SOLID-STATE Cr^{3+}:LiSAF LASERS PASSIVELY Q-SWITCHED WITH Cr^{4+}:YSO CRYSTAL

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Abstract.

We have numerically investigated, for the first time, the optical performance and characteristics of diode-end-pumped passively Cr^{4+}:YSO Q-switched solid-state Cr^{3+}:LiSAF lasers using a rate equation system extended to multi-wavelength. Homogeneously broadened emission spectra of the laser crystal and broad absorption spectra of Cr^{4+}:YSO saturable absorber have been respected in the investigation. A tunable passively Q-switched laser operation is also developed with a birefringent filter plate used as an intracavity selective element. As a result, improved understanding of passively Q-switched Cr^{4+}:YSO solid-state Cr^{3+}:LiSAF lasers has been obtained in broadband and tunable laser operations. Characteristics of the tunable passively Q-switched Cr^{3+}:LiSAF laser were demonstrated to be clearly dependent on wavelength. The spectro-temporal evolution of a single pulse emitted from the passively Q-switched Cr^{3+}:LiSAF laser has been reported.

Key word: *Cr:LiSAF, Cr:YSO, saturable absorption, passively Q-switching, solid state laser.*

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C-18

USING ULTRAVIOLET RADIATION TO CONTROL THE SIZE OF ZINC OXIDE QUANTUM DODS MADE BY SOL-GEL METHOD

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Abstract.

Quantum dots (QDs), highly luminescent semiconductor nanocrystals, have found extensive applications in different fields, ranging from optoelectronic to bio-imaging. Numerous applications are emerging daily, among these, ZnO QDs have higher biological significance because of their relative non-toxicity. We developed a sol–gel method using photo-induced desorption for size-controlled ZnO quantum dots (QDs). This method successfully controlled the size and size variance of ZnO QDs zinc oxide quantum dots with an average diameter approximately 3 nm to 5 nm depending on the ultraviolet irradiation intensity. The intensity, position, and shape do not change even after being aged over 30 days. The blueshift of band gap energies derived from quantum confinement effects was confirmed by optical absorption spectra. Photoluminescence spectra revealed the tunable behavior of ultraviolet luminescence due to exciton localization.

C-19

EIT FOR Λ-LIKE SYSTEMS WITH DEGENERATE AUTOIONIZING LEVELS AND BROAD-BAND COUPLING LASER

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Abstract.

In one of our previous paper [1], electromagnetically induced transparency (EIT) for Λ-like systems consisting of two lower bound states and an autoionizing state embedded in one flat continuum introduced in [2] has been considered, where the laser coupling light applied in the model is assumed to be a δ-correlated, Gaussian, Markov, stationary process (white noise) [3].

In this paper, we investigate a similar scheme, where the continuum structure involved in the problem is replaced by two autoionizing states coupling to a flat continuum [4, 5]. We derive a set of coupled stochastic integro-differential equations which can be averaged exactly. This leads to the exact formula determining the stationary solution for the electric susceptibility. Dispersion and absorption spectra for EIT are found and compared with those obtained previously in [1, 2, 4, 5]. It will be shown that the parameter related to the chaotic component of the control field can be used as an additional important parameter for controlling the characteristics of two EIT windows.

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C-20

STUDY ON THE OPITAL CHARACTERISTICS OF $CuInS_2$, $CuInS_2/ZnS$

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Abstract.

This report presents the results of study on preparing $CuInS_2$, $CuInS_2/ZnS$ (CIS) quantum dots (QDs) by heating up method using diesel solvent. The prepared samples exhibited high crystallinity and small particle sizes (∼3.0 nm) via High-resolution transmission electron microscopy (HRTEM), X-ray diffraction (XRD), Raman scattering spectra measurements. In the range 14 K – 310 K, the absorption spectra of CIS QDs showed clearly the excitonic features; while the photoluminescence (PL) spectra exhibited without characteristics of carrier traps, namely the PL intensity significantly increased with decreasing temperature.

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C-21

PHOTOLUMINESCENCE SPECTRA OF HYBRID STRUCTURE ZnO/GRAPHENE

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Abstract.

We report the influence of graphene buffer layer properties on ZnO photoluminescence spectra in hybrid structure ZnO film/Graphene/Si. First Graphenemade by CVD method was transferred on to Silic substrates. Then ZnO films were prepared by Hummer method. Samples were annealed at different temperature 250^{o}C, 350^{o}C, 500^{o}C respectively. Photoluminescence spectra at ZnO/Si site and ZnO/Graphene/Si site are compared to investigative the interaction between ZnO and graphene. Photoluminescence results show quenching effect and enhancement of ZnO photoluminescence. The reason may caused by property of graphene buffer layer. The Raman shift of 2D peak shows the oxidation of graphene. In XRD results,the crystals of ZnO films were improved at high annealing temperature.

C-22

PLASMONIC EFFECT OF GOLD NANOSHELLS IN TISSUE

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Abstract.

This work presents the research results on thermal effect caused by gold nanoshells in tissue under illumination of a continuous diode laser at 808 nm. The results shown that the gold nanoshells treated tissues resulted in a average temperature 43 ± 4°C at 55 W/cm^2 exposure for 100 seconds. This temperature can induce the irreversible damage to tissue. Our results are consistent with theoretical calculations and have agreement with previous studies. Controls treated without gold nanoshell demonstrated significantly lower average temperatures T = 32 ± 4°C. This study proves that gold nanoshells are promising in photothermal tumor therapy.

Keywords: *gold nanoshells, photothermal effect.*

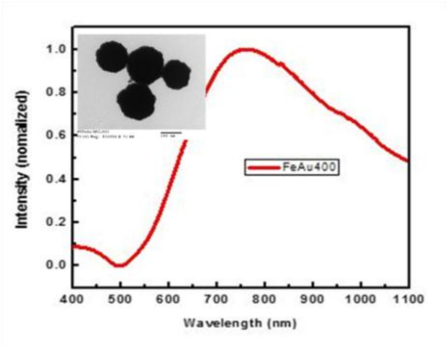

Fig 1. *Nanoshell (FeSiAu) with diameter 140 ±10 nm display a peak surface plasmon resonance at 750 nm.*

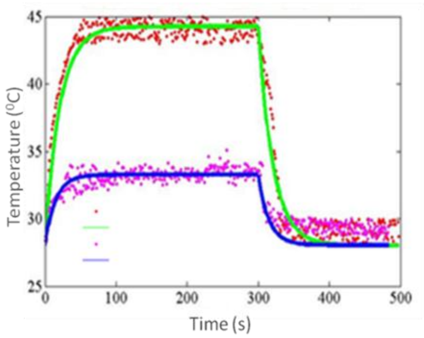

Fig 2. *Temperature variations of tissue samples with (up) and without (down) FeSiAu solutions under the illumination of the laser light at a power density I = 55W/cm^2 as function of time. The solid lines correspond to the theoretical calculations.*

C-23

PHOTOELECTRIC CHARACTERISTICS OF NANO TiO_2 FILM PREPARED BY SPRAYING PYROLYSIS METHOD

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Abstract.

The nanocrystalline TiO_2 (nc TiO_2) film was prepared by spraying pyrolysis method. Starting material for the synthesis was $TiCl_4$. Phase composition and crystalline size were examined by pattern of XRD, and surface morphology of the thin film was analyzed by SEM and AFM. Photoelectric characteristics were examined by UV - Vis and luminescent spectra. Electric characteristics were examined by measuring resistance changging of films with temprature. The experimental data showed that the forming films had nanostructure and typical photoelectric characteristics of nano TiO_2 material similar to ones prepared by other preparing methods. *This* preparing *method has* the *advantages as* compared to others such as requiring *simple equipments, inexpensive* and available *material*s so it is suitable when scaling up in industrial production.

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C-24

PREPARATION OF GRAPHENE QUANTUM DOTS FOR OPTOELECTRONIC DEVICES FROM MULTIWALL CARBON NANO TUBES (MWCNT)

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Abstract.

Graphene quantum dots (GQDs) are nanometer-sized fragments of graphene that show unique properties, which makes them interesting candidates for a whole range of new applications. These have been synthesized either by nanolithography or from starting materials such as graphene oxide (GO) by the chemical breakdown of their extended planar structure, both of which are multistep tedious processes. Here, we report that during the acid treatment and chemical exfoliation of MWCNT, that are both cheap and commercially available, the stacked graphitic sub-micrometer domains of the fibers are easily broken down, leading to the creation of GQDs with different size distribution in scalable amounts. The as-produced GQDs, in the size range of 1-20 nm, show two-dimensional morphology. The photoluminescence of the GQDs can be tailored through varying the size of the GQDs by changing process parameters. Due to the luminescence stability, biocompatibility, low toxicity, and high water solubility, these GQDs are demonstrated to be excellent probes for high contrast bio-imaging and opto-electronic devices applications.

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C-25

USING POLARIZATION SYSTEM TO EXTRACT THE OPTICAL PROPERTIES OF GLUCOSE

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Abstract.

There is growing interest in optical measurements for the noninvasive determination of glucose in human tissue. In this study, optical parameters in linear birefringence, linear dichroism, circular birefringence, and circular dichroism propertiesof turbid media is extracted by a decoupled analytical technique based on the Mueller matrix method and the Stokes parameters. The validity of the proposed measurement method in testing different samples is proved. The experimental results have showed the effective parameters of 5μm and 9μm diameters polystyrene microspheres with containing D-glucose. Then, the circular birefringence property of glucose of three samples is compared and calibrated successfully in this study. This new algorithm introduced here has several advantages not only in solving effective optical parameters but also in maintaining the accuracy by decoupling all parameters in the analytical model. Thus, any purification process in sample is not needed.

Keywords: *Glucose, Polystyrene microspheres, Turbidmedia, Mueller matrix, Stokes.*

C-26

JUDD-OFELT CALCULATIONS FOR Eu^{3+} DOPED BORO - TELLURITE GLASSES

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Abstract.

Europium doped Boro-tellurite glasses with formula B_2O_3-TeO_2-Li_2O-Al_2O_3 was prepared by the conventional melting procedure with difference concentration, optical properties were investigated. Fluorescence spectra were used to determine the asymmetry rounding Eu^{3+} by Ω_λ parameters using Judd-Ofelt theory. The emission spectra of these glasses show a complete removal of degeneracy for the $^5D_0 \rightarrow {}^7F_1$ transition of Eu^{3+} ions. The fluorescence decay of $^5D_0$ level is found to be single exponential for concentration of 0.1, 0.25 and 1.0 mol% of Eu^{3+} ions.

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C-27

RESEARCH AND DEVELOPMENT OF DIODE END-PUMPED SOLID-STATE Cr:LiSAF LASERS

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Abstract.

We present the designs and development of folded four-mirror resonators for diode end-pumped solid-state Cr:LiSAF lasers. The astigmatic effects due to the Brewster-cut laser crystal and two curved mirrors used at oblique incidence were taken into this consideration. The obtained results showed the stability regions of resonator, the beam parameters in the resonator and within the laser crystal as well as any other sensitive parameters and their variation ranges. Furthermore, the designed folded four-mirror resonators for diode end-pumped Cr:LiSAF laser were experimentally evaluated. The CW Cr:LiSAF laser characteristics in threshold, efficiency and beam quality as well as comparative studies are presented discussing our results.

Keywords: *Optical resonator, laser diode pumping, Cr:LiSAF lasers.*

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C-28

MAKING AND INVESTIGATION OF THE SECOND HARMONIC GENERATION EFFECT OF KDP SINGLE CRYSTALS

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Abtract.

The second harmonic generation (SHG), one of basic nonlinear optical effects, may become useful in some new areas such as Lasers, Photonics and Biomedical Engineering. This effect only happens in nonlinear media where interaction between the incident electromagnetic wave with frequency ω and media results in the other wave with double frequency 2ω. Among many nonlinear crystals, KDP (Potassium Dihydrogen Phosphate, KH_2PO_4) is considered a typical material in research the second harmonic generation effect because its cost is relatively low, making and doing outwork easily. In this study, pure KDP single crystals have made successfully in solution medium by the method of movement and temperature lowering and the model of rotating system. Then the best quality crystals were cut and polished, that obeys the law of phase-matching angles: type I 41.1^0 and type II 58.6^0, for which the SHG effect is investigated in 1064 nm Nd:YVO_4 laser with 1.56 W output power. The results show that the power of SHG beam (532 nm) is a second-order function of incident beam (1064 nm). Otherwise, the type II phase-matching angle crystals have higher SHG coefficient than the type I ones. This study can be further developed to increase SHG coefficient of KDP crystals, namely doping organic dyes to KDP crystals.

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C-29

THE PROCESS OF IMMOBILIZATION OF ZnO NANORODS SURFACE WITH GALACTOSE OXIDASE – APPLY TO GALACTOSE BIOSENSOR

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Abstract.

ZnO nanorods, with the c-axis orientation has been used for transparent conductors, solar cells, sensors…, especially the functionalized ZnO nanorods with some kinds of enzymes has been used for biosensor [1-3]. In this work, we describes the process of immobilization galactose oxidase on ZnO nanorods surface with glutaraldehyde as a cross-linker molecule. The crystalline phase and orientation of ZnO nanorods were identified using X-ray diffraction. The morphology of ZnO nanorods sufface before and after modifying with galactose oxidase is different and were observed using a scanning electron microscope (SEM). Comparing the FTIR spectrum of galactose oxidase immobilized ZnO nanorods to the FTIR spectrum of pure ZnO nanorods shows that some peaks at 554 cm^{-1}, 3247 cm^{-1}… were shifted, this results demonstrates the interaction between the galactose oxidase enzyme molecules with the surface of ZnO nanorods. These above results clearly indicate the potential of galactose sensor based on ZnO nanorod.

Keywords. *ZnO nanorod, galactose biosensor*.

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C-30

SYNTHESIS AND LUMINESCENT PROPERTIES OF RAVE EARTH DOPED PHOSPHATE GLASSES

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Abstract.

The rave-earth (RE) doped solids general and RE doped glasses in particular have received considerable attention because of their applications in sensors, waveguides, lasers, lighting technique etc. Therefore, RE doped phosphate glasses materials based on P_2O_5-CaO-Na_2O system were prepared by melt quenching method, using pure reagent grades of $NH_4H_2PO_4$, $CaCO_3$, $NaCO_3$ and RE oxides (RE: Eu, Tb, Dy). Excited and photoluminescent spectra of received glasses were examined. This paper presents the discussions about detail process for preparing glasses and the photoluminescent characters of glasses doped and co-doped RE.

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C-31

EVALUATION OF SOME IMAGING TECHNIQUES FOR THE DETECTION OF VEIN IMAGING

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Abstract.

The near infrared (NIR) imaging of vein has wide applications in biomedical fields. NIR imaging allows visualizing the veins underneath the skin of those having non-visibility of veins problem, mapping the normal and abnormal veins in treating disorders, or diagnosing related diseases [1]. In this paper, three main methods to capture the vein image were studied: transmission method, reflection method, and the combination of transmission and reflection method. We have chosen 850-nm wavelength as the main source for illumination, which has low absorption window and provides higher contrast of vein imaging. The contrast ratio were calculated using modified algorithm based on different formula (C&M). Analysis and evaluation of the advantages and disadvantages of mentioned methods were presented as well.

Keywords*: NIR imaging, vein infrared, vein detection.*

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C-32

NUCLEIC ACID STRIP BIOSENSOR BASED ON GOLD NANOPARTICLES FOR RAPID DETECTION OF BREAST CANCER ANTIGEN

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Abstract.

This work describes the results on fabrication of a nucleic acid strip biosensor for rapid and sensitive detection of breast cancer antigen. Combining the unique optical properties of gold nanoparticles (AuNP) and the high efficiency of chromatographic separation, sandwichtype DNA hybridization reactions were realized on the lateral flow strips, which avoid multiple incubation, separation, and washing steps in the conventional nucleic acid biosensors. The captured Au-NP probes on the test zone and control zone of the biosensor produced the characteristic red bands, enabling visual detection of breast cancer antigen samples without instrumentation. The parameters that govern the sensitivity and reproducibility of the sensor were investigated.

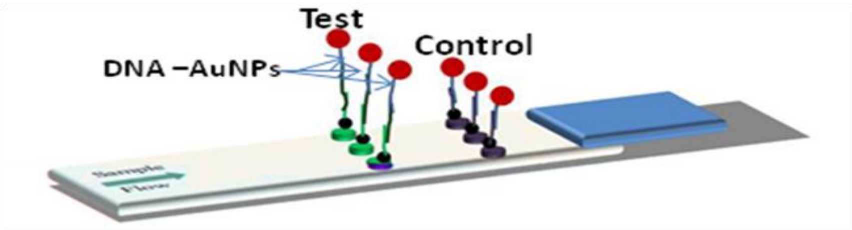

Fig. 1. *Schematic illustration of the DNA-AuNPs strip sensor.*

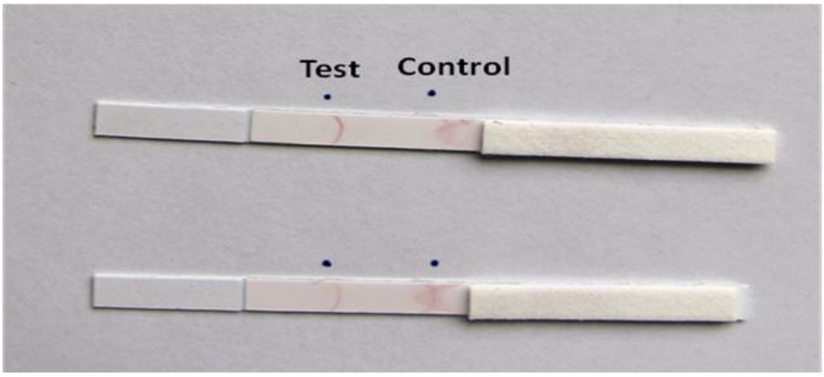

Fig. 2. *Images of test strips using DNA-AuNP signaling probes specific for HER2 receptors.*

C-33

PREPARATION AND OPTICAL PROPERTIES OF THE TERNARY ALLOY QUANTUM DOTS FOR THE POTENTIAL APPLICATION IN SOLAR CELL

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Abstract.

The binary quantum dots (QD) as CdSe, ZnSe, CdTe or their ternary alloy CdZnSe and CdSeTe QDs have been extensively studied with potential applications in manufacturing the quantum dot laser [1], the light-emitting devices (LED) [2], solar cells using QDs as sensitizer (Quantum Dot Sensitized Solar Cell- QDSSC) [3], bio-sensor, etc, because of the attractive optical properties are varied according to their sizes. From binary QD as CdSe, we can replace partially the Cd2+ cations by Zn2+ cations to create a CdZnSe ternary alloy QDs. This type ternary alloy QD has been reported the ability to reduce the fluorescent blinking (non-blinking), a great significance in the fabrication of QD-LED and biosensors, etc. We can also replace a part of the Se anions by the Te anions to create the CdSeTe ternary alloy QDs. The change in the concentration of Se in CdSeTe ternary alloy QDs and with the appropriate nano size of the QD, we can fabricate CdSeTe which their absorption band changes from red light region to the near infrared region (800 nm). The expansion of this absorption band makes it very attractive for use as sensitizer in the solar cell because of increasing light sensitivity.

In this report, we present the results on the fabrication and optical properties of two types of ternary alloy quantum dots CdZnSe and CdSeTe. Some new remarks and the different from the other publications will be clarified. Two types of quantum dots above were fabricated by two different methods with their advantages and disadvantages will be presented in detail. The study of the size, composition, emission spectra and absorption spectra and the quantum yield of the ternary QDs above will be reported. Several experimental results using these quantum dots as a sensitizer in the quantum dot sensitized solar cells (QDSSC) devices will be presented in this report.

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C-33

CHẾ TẠO VÀ TÍNH CHẤT QUANG CỦA CÁC CHẤM LƯỢNG TỬ HỢP KIM BA THÀNH PHẦN, ĐỊNH HƯỚNG ỨNG DỤNG TRONG PIN MẶT TRỜI

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Tóm tắt.

Các chấm lượng tử (QD) hai thành phần như CdSe, ZnSe, CdTe và hợp kim ba thành phần của chúng như CdZnSe và CdSeTe gần đây đã được nghiên cứu rất nhiều, do các ứng dụng tiềm năng của chúng trong công nghệ chế tạo laser chấm lượng tử [1], các các linh kiện phát sáng (LED) [2], pin mặt trời dùng QDs làm chất nhậy sáng (QDSSC) [3], cảm biến sinh học, v.v… bởi các tính chất quang học ưu việt thay đổi theo kích thước của chúng. Xuất phát từ QD hai thành phần, ví dụ như CdSe, ta có thay thế một phần các cation Cd^{2+} bằng các cation Zn^{2+} để tạo ra loại QD hợp kim ba thành phần CdZnSe. Loại QD ba thành phần này đã được báo cáo là làm giảm bớt được sự nhấp nháy huỳnh quang (non-blinking), có ý nghĩa rất lớn trong việc chế tạo QD-LED và cảm biến sinh học. Ta cũng có thể thay thế một phần các anion Se bằng các anion Te, để tạo ra các QD hợp kim ba thành phần CdSeTe. Việc thay đổi thành phần của Se trong CdSeTe và với kích thước nm thích hợp của QD, cho phép ta có thể chế tạo được các CdSeTe, mà dải hấp thụ của chúng thay đổi được từ vùng ánh sáng đỏ tới vùng hồng ngoại gần (800 nm). Sự mở rộng dải hấp thụ này làm cho chúng rất hấp dẫn cho ứng dụng làm chất tăng nhậy trong pin mặt trời.

Trong báo cáo này, chúng tôi sẽ trình bầy các kết quả về chế tạo, tính chất quang của hai loại chấm lượng tử ba thành phần là CdZnSe và CdSeTe. Một vài điểm mới và khác biệt với những công bố quốc tế khác sẽ được làm rõ. Hai loại chấm lượng tử này được chế tạo bằng hai phương pháp khác nhau, các ưu nhược điểm của chúng sẽ được trình bầy chi tiết. Các nghiên cứu chi tiết về kích thước, thành phần, phổ phát xạ và hấp thụ, hiệu suất lượng tử của các mẫu QDs ba thành phần kể trên sẽ được báo cáo. Một số kết quả thực nghiệm về chế tạo pin mặt trời và dùng các chấm lượng tử mới này làm chất tăng nhạy sáng trong linh kiện pin mặt trời cũng sẽ được trình bầy trong báo cáo này.

C-34

PREPARATION OF HYBRID TRANSPARENT ELECTRODES OF SILVER NANOWIRES AND CHEMICALLY CONVERTED GRAPHENE ON ABITRARY SUBSTRATE AT LOW TEMPERATURE

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Abstract.

Graphene has enjoyed significant recent attention due to its potential applications in electronic and optoelectronic devices. Graphene is usually prepared via Hummers' method or modified Hummers' methods. These method are the most suitable for the large-scale production of single graphene at low cost but the main drawbacks of these method are the use of strong oxidizing agents make graphene films were separated small sheets leading to extremely decrease its electrical conductivity. Herein, we report an inexpensive, fast and facile method for preparation of a double layer structured transparent, flexible hybrid electrode from silver nanowires (Ag NWs) with chemically converted graphene (CCG) coating on arbitrary substrate. This way have resulted in the resistance of graphene films dramatically decreases (the low sheet resistance is about 18Ω/□) but still exhibited high optical transmittance (82.4%), which was comparable to ITO transparent electrode. They also showed the ratio of direct conductivity to optical conductivity δ_{DC}/δ_{OP} = 104 were very close to that displayed by commercially available ITO. Especially, the whole fabrication process was carried out at low temperature. The graphene films was spin coated directly on the substrate without transferring, eliminated many troubles bring back from transfer method.

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C-35

DESIGNING THE LONG DISTANCE - INFRARED MEASUREMENT SYSTEM

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Abstract.

Nowadays, the long distance - measurement and non-contact measurement method are being researched and developed. These methods not only satisfy the functions of direct measurement methods but also exceed surpass by their advanced characters. Generally, the system principle usually applied the physical properties of light and appropriate optical system. In this research, we offer an optical scheme applying to a long distance - measurement devices; accompany a calculation method, acquisition and execution signals then convert to measuring signals. Measurement system using Michelson interferometer with the straight movement of mirror set up with laser source being regarded as reference light source (wave length of 632.8 nm), the range of measurement from 2 to 14 µm, accompany with the frequency from 5 to 30 MHz, and distance from 500 to 1000 mm.

Keywords: *Michelson Interferometer, Fourier Transform – Infrared Radiation FT-IR, Open Path - Fourier Transform Infrared Radiation OP-FTIR.*

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C-36

DESIGN LENS OBJECTIVE OF THERMAL IMAGE DEVICE

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Abstract.

The result of studying design method and a solution of all lens objective for thermal image device is presented. Based on standard curvature set from manufacturer at Vietnam, the lens parameters are calculated. This approach helps to ease the problem in fabricating phase of objective.

NGHIÊN CỨU THIẾT KẾ VẬT KÍNH DÙNG CHO HỆ QUANG ẢNH NHIỆT

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Tóm tắt.

Bài báo trình bày kết quả nghiên cứu phương pháp thiết kế và một phương án thiết kế vật kính thấu kính dùng cho thiết bị quang học ảnh nhiệt chuyên dụng. Việc chuẩn hóa thông số kết cấu theo dưỡng gia công của nhà máy chế tạo là cơ sở để nghiên cứu công nghệ chế tạo loại vật kính này trong điều kiện Việt Nam.

C-37

IMPROVING THE AMMONIA SENSING OF REDUCED GRAPHENE OXIDE FILM BY USING NANOMETER METAL MATERIALS

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Abstract.

Gas sensing is one of the most promising applications for reduced Graphene Oxide (rGO). High surface-to-volume ratio in conjunction with remaining reactive oxygen functional groups translates into sensitivity to molecular on the rGO surface. The response of the rGO based devices can be further improved by functionalizing its surface with nanometer metal materials. In this paper, we report the ammonia (NH_3) sensing behavior of rGO based sensors functionalized with three metals: silver (Ag), platinum (Pt), and gold (Au) in air at room temperature and atmospheric pressure. The gas species are detected by monitoring changes in electrical resistance of the rGO/metal hybrids due to gas adsorption. Compared to bare rGO, significantly improved NH_3 sensitivity is observed with the addition of nanometer metals. The nanometer metals are applied to play the small bridges role connecting many graphene islands together to improve electrical properties of hybrids while maintaining the inherent advantage of rGO for NH_3 gas sensitivity.

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C-38

SYNTHESIS AND CHARACTERIZATION OF FLUORESCENT GOLD NANOCLUSTERS FOR BIOLOGICAL APPLICATIONS

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Abstract.

We have prepared and characterized a fluorescent gold nanoclusters (AuNCs) using aqueous redution of chloroaric acid in the presence of mecapto undecanoic acid (MuA). These AuNCs strongly absorb at 370 nm and flouresces in visible region with tunable emission from 520 to 570 nm. The nanoclusters exhibit a quantum yield of few percent and a fluorescent lifetimes about 2-3 ns. These propeties make these flourescent AuNCs greatly promising for biological applications.

Keyword: *fluorescent gold nanoclusters, fluorescent quatum yield, quantum dot.*

C-39

TIME RESOLVED LASER ABSORPTION SPECTROSCOPY IN PULSED DISCHARGES

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Abstract.

C-40

POLYMORPHS CHARACTERIZATION OF $BaTi_{1-x}Ni_xO_3$ ($0 \le x \le 0.1$)

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Abstract.

We have studied the influence of the Ni doping on structural characterization of $BaTi_{1-x}Ni_xO_3$ (x = 0.0 - 0.1) prepared by conventional solid-state reaction. The composition and crystalline phase transformationis are characterized by X-ray diffraction technique and Raman scattering spectroscopy. Our experimental results show that the tetragonal-to hexagonal transformation in the crystal structure of $BaTi_{1-x}Ni_xO_3$ at x = 0.06. There is the coexistence of Ni^{2+}, Ni^{3+} and Ni^{4+} ions in the two structural phases, in which more Ni^{2+} ions are created as increasing the Ni concentration in $BaTi_{1-x}Ni_xO_3$. However, due to the ionic radius of Ni^{2+} ion is approximately the ionic radius of Ti^{4+} ion, so the substitution of Ni^{2+} ions for Ti^{4+} ions did not affect the change of unit cell volume, therefore as increasing the concentration of Nickel, unit cell volume, in both cases (tetragonal phase and hexagonal phase) gradually increases.

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C-41

THE RESULTS OF THE APPLICATION OF ENDOVASCULAR LASER TREATMENT OF HEADACHES AND INSOMNIA IN THAI NGUYEN

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Abstract.

Laser technology has been widely applied in the country as well as in the world. In particular, the low-power laser and intravascular laser have been being applied very commonly in local hospitals and clinics as well in central ones. In Thai Nguyen, the intravascular laser also has been applying in the treatment of diseases in the hospitals, clinics, and centers for physical therapy in the province. In this report, we present the results of using the intravascular laser (He-ne laser, semeconductor laser) in treating patients with headaches and insomnia in Thai Nguyen Hospital of Nursing & Rehabilitation and Minh Tien clinics in Dai Tu district in Thai Nguyen Province.

Keywords: *Medical laser, Intravascular laser*.

C-42

EFFECT OF POST-ANNEALING ON THE MEMORY WINDOW AND INTERFACE TRAP DENSITIES BETWEEN TUNNELING AND ACTIVE LAYER OF InGaZnO NONVOLATILE MEMORY DEVICE

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Abstract.

Nonvolatile memory (NVM) device with oxynitride–oxide–dioxide (OnOxO) stack structure was fabricated with directly deposited a-IGZO thin films at room temperature. The effect of different post-annealing NVM processes at room temperature, 150 ^oC, 250 ^oC, and 350 ^oC were investigated. When the annealing temperature was increased, the threshold voltages (V_{TH}) were increased from -0.14 V to 0.25 V, the subthreshold swing (SS) and the I_{ON}/I_{OFF} of NVM device were decreased from 0.76 V.dec^{-1} to 0.24 V.dec^{-1} and from 6.3×10^3 to 1.5×10^6, respectively. In addition, increased post-annealing temperature, the memory window of NVM device was smaller but better retention. Therefore, the post-annealing at 250 ^oC was selected to fabricate NVM device.

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C-43

SYNTHESIS AND BIOFUNCTIONALIZATION GOLD NANOSHELLS FOR BIOMEDICAL APPLICATIONS

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Abstract.

Gold nanoshells (GNSs) were grown on monodispersed aminoprotpyltriethoxysilane (APTES) functionalized of silica nanoparticles (NPs) cores with varying sizes ranging from 40-180 nm synthesized by Stober route. Gold shells were deposited onto the surface of silica NPs by tetrakis(hydroxymethyl) phosphonium chloride (THPC) and electroless gold plating method. The coverage of the gold nanoshells on the surfaces of the silica NPs was evaluated using surface plasmon resonance spectra and transmission electron microscope (TEM). The plasmon resonance wavelengths of these GNSs were tunable from visible to near infrared region. The GNSs were also attached with bio molecules. The attachment process of bio-molecules onto the GNSs surfaces were controlled by measuring both their SPR spectra and their zeta potentials.

Keyword*: gold nanoshells, Surface Plasmon Resonance, zeta potential.*

C-44

ỨNG DỤNG LASER BÁN DẪN CÔNG SUẤT CAO ĐỂ PHẪU THUẬT THÔNG TÚI LỆ - MŨI

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Tóm tắt.

Báo cáo trình bày kết quả bước đầu của phương pháp mới – phẫu thuật nội soi, lần đầu tiên được thực hiện ở Việt Nam – nối thông túi lệ - mũi bằn laser qua tiểu lệ quản, để điều trị bệnh viêm tắc túi lệ. Hai loại laser bán dẫn công suất cao (laser diode 980nm công suất 10 W và 810nm công suất 30 W), có ghép nối với cáp quang 3 m, đường kính 0.4 – 0.6 mm, do Viện Vật lý chế tạo và vận hành, đã được thử nghiệm thành công trong phẫu thuật mắt cho 20 bệnh nhân, khoảng thời gian từ năm 2008 đến nay. Báo cáo cũng nêu chi tiết các thông số kỹ thuật của 02 loại laser kể trên và so sánh với nhau trong trường hợp phẫu thuật này - khoan xương mũi với hiệu ứng nhiệt rất thấp để không làm bỏng các mô xung quanh và dễ dàng làm bốc bay các tổ chức tế bào (da, thịt, xương…), đồng thời cầm máu tốt.

Kết quả mở thành công 100% trong một lần phẫu thuật, kể cả các trường hợp biến dạng xương do chấn thương hoặc do đã phẫu thuật bằng phương pháp khác nay tái phát bệnh, chứng tỏ ưu việt của phương pháp mới này. Tái khám theo thời gian hậu phẫu (trường hợp dài nhất tới > 40 tuần) đều cho kết quả rất tốt và khẳng định nối thông túi lệ - mũi bằng laser qua tiểu lệ quản là một phương pháp phẫu thuật mới, rất hiệu quả, an toàn và đầy triển vọng.

APPLICATION OF HIGH-POWER DIODE LASER FOR ENDOCANNALICULAR DACRYOCYSTO-RHINOSTOMY

Abtract.

This report presents primary results of the new method for endocanalicular dacryocysto-rhinostomy, which is applied the first time in Vietnam, in the Military Hospital 108 in last 3 years (2010 – 2014). Two type of the semiconductor high-power diode laser (diode laser 980 nm with 10 W power and 810 nm with 30 W power), which have a output by optical fiber 3m long, diameter 0.4 – 0.6 mm, are using in endocanalicular operation. In this we have to drill a small hole through nasal bone with purpose to conect tear-gland to the nose. Results: Dacryocystorhinistomy is done successfully in 22/22 eyes (100%), among them, difficulty arose in 3 eyes of traumatogenic bone deformity, structural and functional results obtained in all 22 eyes. After deintubating, good and stable results obtained in totally 22/22 eyes with the follow-up to 39 weeks.

As results, we came to following conclusion: Endocanalicular laser-assisted dacryocystorhinostomy is a new efficacious and safe surgical method.

Keywords: *Dacryocysto-rhinostomy (DCR), endocanalicular, high-power semiconductor laser.*

FINGERPRINT DETECTION BY LASERS

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Abstract.

In this paper, we apply the method of laser excitation combined with use of fluorescent dyes to detect latent fingerprints (fingerprints are not visible to the naked eye). In this method, first of all, samples are suspected to contain fingerprints treated with Cyanoacrylate gas to locate Fingerprint, then samples were treated with fluorescent dyes and illuminated with laser light. This method can be extended to detect fingerprints on human skin, a problem that Vietnam Criminal science can not resolved in this time.

C-46

HIGH IMPEDANCE SURFACE ABSORBER FOR K BAND FREQUENCY APPLICATIONS

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Abstract.

New configurations of high impedance surface absorber structures based on a metamaterial (MM) substrate are presented for K band frequencies. The high impedance surfaces are designed using metallic rectangle or circle metallic ring embedded into a dielectric slab. The simulation results display a deep absorption peak around 22 GHz and an expanded absorption bandwidth of less than -10 dB compared to conventional absorbers. By analyzing the field distributions and the substrate impedance characteristics, we found that this feature is mainly related to the nature of substrate and LC resonance caused by the HIS surface. Our results demonstrate the great absorption and wide bandwidth of this HIS absorber.

Keywords: *HIS, absorber, MMs.*

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C-47

EFFECT OF LASER ANNEALING ON PROPERTIES OF CuO NANOCRYSTALS PREPARED BY MICROWAVE IRRADIATION METHOD

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Abstract.

Cupric oxide (CuO), as one transition metal oxide, is recently attractive in many science and technology fields due to its unique properties compared with other transition metal oxides such as: high thermal conductivity, ferromagnetism, highly active catalyst properties… Most of these interesting characteristics of CuO closely relate to surface properties of material and hence, was enhanced greatly in nanoforms where surface/volume ratio is much higher than that of the corresponding counterpart. These interesting properties make cupric nanostructures potential candidates for technological applications. This fact raised a demand for mass production of good quality of CuO nanomaterials. In this regard, microwave irradiation as a fast, economical, environment friendly method, is a very good selection. However one of the inevitable problems of nanomaterials is the formation of defect on the surface of nanoproduct, which could bring some unintended effect.

In this paper, we reported the preparation of CuO nanocrystals by microwave irradiation method. High purity and quality of the as prepared nano-products were confirmed by some characterization techniques such as Xray diffraction (XRD), Raman scattering, Scanning electron microscopy (SEM) and UV visible spectroscopy. Raman spectra showed that the as-prepared products have good crystallinity with characteristic peaks of CuO material, but also showed some peaks which were attributed to defects on surface of the nanostructures. After laser treatment, Raman results showed that the number of defects reduced and the crystal quality of CuO nanocrystal was improved.

Keywords: *cupric oxide, microwave irradiation method, laser annealing, Raman spectra.*

C-48

FORSTER RESONANCE ENERGY TRANSFER (FRET) WITH A METAL NANOPARTICLE AND SURFACE PLASMON ENERGY TRANSFER (SET) MECHANISM

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Abstract.

Forster resonance energy transfer (FRET) with a metal nanoparticle has been widely used in modern bio-nano technology and medical application, especially in cancer treatment. From the experimental point of view still now not clear which mechanism is observed?: standard Forster resonance energy transfer (FRET) with typical d^{-6}-law, where d is the distance between donor and acceptor, or surface plasmon energy transfer (SET) with d^{-4}-law mechanisms? Yet no single theoretical model has been explaining and cleaning that. In this work, based on analyze the recently obtained experimental data, we suppose a new reasonable model with mixing mechanism: continue changing from FRET-mechanism for small size to SET-mechanism for large size metal nanoparticles.

C-49

USAGE OF SOLID-SATE SATURABLE ABSORBER Cr^{4+}:YAG IN PASSIVELY Q-SWITCHING MONOPULSED Nd:YAG LASER

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Abstract.

Theoretical analysis is presented to evaluate the performance of a passively Q-switched monopulsed Nd:YAG laser with Cr^{4+}:YAG as a solid state saturable absorber. Several of system design parameters of such laser system can be obtained by analysing and solving the passive Q-switch rate equations. Some of application results of Cr^{4+}:YAG Q-switch in forming 1064 nm high energy laser pulses at CSEI are described.

PI - 01

EFFECT OF MORPHOLOGY OF TWO-LAYERED NANOPARTICLES ON THEIR OPTICAL PROPERTIES

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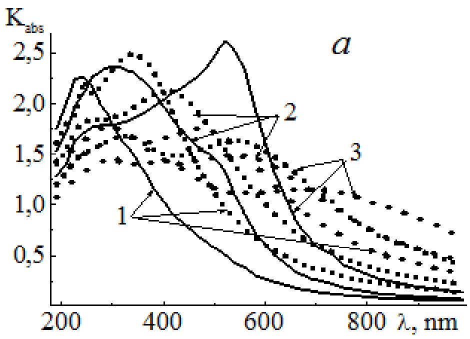
Abstract.
Two-layered nanoparticles are widely used in laser nanomedicine for thermal action of laser pulses on nanoparticles and optical diagnostics of tissues loaded by nanoparticles, for experimental investigation of shell formation on nanoparticle core and optical determination of geometrical parameters of core and shell of two-layered nanoparticles. Optical properties of spherical two-layered gold core – palladium shell and palladium core – gold shell placed in water on parameters of core and shell were simulated on the base of extended Mie theory. Spectral dependencies of efficiency factors of absorption, scattering and extinction of radiation by core-shell nanoparticles in the interval of the core radii r_0=10, 20 and 40 nm and of shell thicknesses Δr =5, 20 and 40 nm were calculated. Gold and palladium are used as a basis for core and shell of two-layered nanoparticles because of their properties suitable for many applications. These metals are widely employed in experiment. Results show nonlinear dependences of optical properties of two-layered nanoparticles on morphology of nanoparticles, parameters of core and shell. Increase of palladium shell thickness leads to shift of plasmonic resonance in the UV spectral region (Fig.1*a*). Maximal plasmonic resonance ($K_{abs}^{\max}$ ≈2,61) for gold-palladium nanoparticles is situated for λ=521 nm, r_0=40 nm, Δr=5 nm. In the case of palladium-gold nanoparticles plasmonic resonances are shifted in the direction of larger wavelengths (Fig.1*b*). Maximal plasmonic resonance ($K_{abs}^{\max}$ ≈3,72) for palladium- gold nanoparticles is situated for λ=530 nm, r_0=20 nm, Δr=5 nm. Such behavior of spectral dependences of gold-palladium and palladium-gold nanoparticles is satisfactorily agreed with the electromagnetic energy distribution inside gold-palladium and palladium-gold nanoparticles.



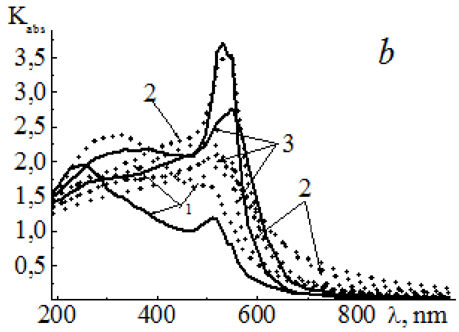


Fig. 1. *Spectral dependences of efficiency factors of absorption of radiation by two-layered gold core – palladium shell (a) and palladium core – gold shell (b) spherical nanoparticles, placed in water. Core radii of nanoparticles are r_0 =10 nm (1), 20 nm (2), 40 nm (3). Shell thicknesses are: Δr=5 nm – solid lines; Δr=20 nm – dotted lines; Δr=40 nm – dashed lines.*

PI - 02

IDENTIFICATION OF MATURED WINE DISTILLATES BY MEANS OF PCA, LDA/QDA, CLASSIFICATION TREES AND PLS1 APPLIED TO UV-VIS-NIR TRANSMISSION SPECTRA

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Abstract.
Most consumers are very much worried about their own health and want to take natural and authentic foodstuffs nowadays. Authentic problem is rather difficult in manufacture and quality control of cognacs and brandies produced from matured wine distillates. In this work we try to identify the matured Moldavian wine distillates. UV-Vis-NIR spectroscopy together with chemometrics methods [1] are used for proof of the authenticity of investigation objects. Broadband transmission spectra (190–2600 nm) of 42 representatives consist of 2698 spectral data counts. Principal component analysis (PCA) is applied for decomposition of multidimensional spectral counts space to low-dimensional space of principal components (PC). Explained variance of distillates' transmission spectra is shown to be as much as 98.9% for 4D space of PC.
Linear and quadratic discriminant analysis (LDA and QDA) are applied for two class identification of distillates' manufacturers in 2D space of PC. LDA and QDA are shown to classify successfully 12 pairs of distillates' manufacturers from 15.
Another kind of supervised machine learning applying for identification of manufacturers is classification trees making [2]. The best results are obtained for the algorithm considering all possible 2^{L-1}-1 combinations of L-level predictor and Gini's diversity index. Using 3 PC this classification tree can identify 5 manufacturers from 6.
The second identifier of authenticity of wine distillates is the age. For determining this parameter from transmission spectra we use the projection on latent structures (PLS1) [3]. 21 latent structures give the regression factor of 0.98 on 42 representatives of distillates and provided cross-validation by one-leave-out. Results obtained by PLS1 show the unambiguous definition of distillates' age with relative errors being within 8% limits.
Therefore, application of chemometrical methods (principal component analysis, discriminant analysis, classification trees, projection on latent structures) to broadband transmission spectra of wine distillates allows to define the manufacturers and ages of investigated objects. Hereby one of the possible ways is demonstrated for solving the authenticity problem of matured wine distillates.
Part of the presented results is obtained in joint project № F13MLD-011of Belorussian Fond for Fundamental Research and № 13.820.14.07/BA of Moldavian Fond for Bilateral cooperation program between the Academies of Sciences.

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PI - 03

AEROSOL CONTENT IN ATMOSPHERE BY DATA OF REMOTE GROUND-BASED AND SATELLITE MEASUREMENTS AND MODELLING

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Abstract.

Aerosol is an important climate factor and one of the major air pollutants. Atmosphere aerosol largely determines the ecological situation in the region. Elevated levels of aerosol in the atmosphere are bad for human health. Therefore, it is important to control the level of aerosol contamination of atmosphere.

The radiometric network AERONET [1], lidar networks and satellite measurements provide valuable information about the content of aerosol in the atmosphere. However, the ground-based measurements can be carried out only in a limited number of geographical locations. Satellite measurements have a sparse temporal coverage (up to a week). Combination of satellite and ground-based observations with a global 3-D chemical transport model allows obtaining an integrated picture of spatial and temporal atmospheric aerosol distribution. Model can also provide additional information, e.g. atmospheric aerosol fraction composition.

We used version v9-02 GEOS-Chem model [2, 3] based on meteorological fields GEOS-5 (GEOS-fp for 2013). The model provides a spatio-temporal distribution of the main types of atmospheric aerosols: sulfate, ammonium, nitrate, soot (black carbon), organic aerosol, sea salt aerosol of fine and coarse fractions, and mineral dust distributed over size.

We compared simulated monthly averaged column aerosol concentrations in atmosphere with the data of network AERONET. Calculated aerosol optical thickness of atmosphere was compared with AERONET and MODIS [4] data. The regions of comparison were Europe and Vietnam. The model and measurement data are in a good agreement. Lidar data obtained in Hanoi and Minsk were also compared with the model aerosol vertical distribution. The reasons of some discrepancies between the model and lidar measurements are discussed.

The maps of the column and near-ground aerosol content were built on the basis of model calculations for Vietnam and Belarus territory. Besides, we obtained an averaged aerosol fraction composition for the two countries.

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PI - 04

STIMULATED RAMAN SCATTERING OF PICOSECOND LASER RADIATION IN LIGHT AND HEAVY WATER

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Abstract.

Stimulated Raman scattering (SRS) in light water (H_2O) was studied in [1] for the first time. SRS in heavy water (D_2O) was recently investigated in [2]. In this report, we present the new results of our comparative studies on SRS of ultrashort laser radiation in light and heavy water.

In the experiment, a picosecond Nd:YAG laser at 532 nm was used. The energy of picosecond laser pulses of about 60 ps duration with a pulse repetition rate of 20 Hz was varied in the range of 0.1 - 30 mJ. Laser beam was focused into the fused silica cell with water using a lens of about 20 cm focal length. Experimental optical scheme allowed us to observe SRS in the forward and backward directions. The scattered radiation was directed into the fiber tip. SRS spectra were registered using a mini-spectrometer with a CCD-detector.

Raman threshold in light water was equal to about 0.2 mJ of pumping pulse energy. The maximum SRS efficiency reached up to about 7 - 10 %. At small exciting energy (~ 1 mJ), the observed Stokes component had the shape of a wide band with several peaks corresponding to the fundamental mode. After increasing of the exciting energy (to about 10 mJ) Raman intensity of this band was increased and its width was essentially decreased. With increasing the exciting power, the spectral position of SRS component was shifted from 3186 up to 3424 cm^{-1}. In the backward scattering geometry, we observed two wide satellites (Stokes and anti-Stokes) in low frequency region (780 cm^{-1}). Such satellites may be attributed to the librational mode, ν_{lib}. Also, a weak maximum at 1650 cm^{-1} was observed corresponding to other fundamental mode, $\nu_2(A_1)$.

In SRS spectrum of heavy water, the most intensive line with a frequency of $\nu_1(A_1)$ = 2448 cm^{-1} was observed. Raman threshold in heavy water was about 0.1 mJ of pump pulse energy. It is substantially lower in comparison with light water. The maximum SRS efficiency was about 10 - 15 %. Two distinct Raman lines in the Stokes components, one of which corresponds to the fundamental mode, $\nu_1(A_1)$ and another is a combination of the fundamental one with the libration mode, $\nu_1(A_1) + \nu_{lib}$ were revealed.

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PI - 05

Z-SCAN STUDIES OF VANADATES CRYSTALS AT 532 nm

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Abstract.

Vanadate crystals are used in diode-pumped solid-state lasers [1]. Vanadates have useful properties for applications in such lasers in comparison with other crystals [1]. However, nonlinear optical properties (nonlinear refraction and absorption) of vanadates which influence the laser radiation parameters substantially were not yet studied fully so far. In this report, we present the results of measuring the nonlinear indices of refraction and nonlinear absorption coefficients in a number of vanadate crystals using the single-beam Z-scan method.

In the experiment, a picosecond Nd:YAG laser generating the pulses (of about 60 ps duration) at 532 nm with a repetition rate of 20 Hz was used. Linear polarized laser beam was focused into the studied samples with a lens of about 20 cm focal length. The studied vanadates were: $GdVO_4$, Nd:$GdVO_4$, YVO_4, Nd:YVO_4, $Gd_{0.64}Y_{0.36}VO_4$, Yb:$Gd_{0.64}Y_{0.36}VO_4$, and Er,Yb:$Gd_{0.64}Y_{0.36}VO_4$. The crystal samples had different cuts (“a” and “c”) and were of 3 mm thickness. In the case of crystals activated with ions, the ion concentration was equal to about 0.3 at. %. The optical scheme of the single-beam Z-scan is well known [2, 3]. For measuring nonlinear refraction, we used a closed-aperture Z-scan with a diaphragm of 2.5 mm in a diameter placed at a distance of 120 cm from focal waist. Fused silica was used as a reference material. Nonlinear absorption was investigated in an open-aperture channel. During the measurements we changed the crystal orientation relative to the polarization of laser radiation (parallel or perpendicular).

Our results show that all vanadates crystals demonstrate strong nonlinear refraction and absorption which are higher in comparison with the known crystals. Besides, these nonlinear optical effects depend on orientation of the crystals relative to the direction of laser radiation polarization. The obtained results must be taken into account by the researchers when developing the laser devices based on the vanadates crystals.

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PI - 06

SENSITIVITY OF FLUORESCENCE-INTENSITY RATIO TEMPERATURE MEASUREMENT IN Er-DOPED CRYSTALS AND NANO-GLASS-CERAMICS

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Abstract.

One of the methods used for temperature measurement by optical sensors is fluorescence-intensity ratio (FIR) [1]. Populations of two closely spaced energy levels of a fluorescent center are related by Boltzmann factor. Thus the fluorescence from these levels is temperature-dependent and the ratio of intensities of the two spectral lines allows measuring the temperature of the medium. The best fluorescent properties of rare-earth doped crystals allow using them as a sensing medium. However for use in optical fiber sensors the sensing medium should allow fiber drawing. Optical glasses doped with Er or other rare earths meet this requirement. The prospective counterpart widely studied last years is nano-glass-ceramics. It consists of glass host embracing nano-sized crystals. Combining both crystalline and glass phases potentially gives nano-glass-ceramics the possibility to possess good fluorescent properties and to draw into the fiber form.

The purpose of our work is to clarify if the nano-glass-ceramics could be competitive with doped crystals in regard of FIR temperature sensing. Two Er- and Yb-doped crystals (YVO_4 and $YGdVO_4$, Er concentration 0.6%) and two nano-glass-ceramics (SiO_2 – PbF_2 – Al_2O_3 – CdF_2 – ZnF_2) are considered. The nano-glass-ceramics differ by secondary heat treatment time at 520°C (10 hours and 4 hours, respectively) and by dopants content (2.5% of YF_3, 0.5% ErF_3 for the first and 1% YF_3, 2% ErF_3 for the second one).

The samples were pumped by 1 W laser diode at 967 nm. Upconversion fluorescence of Er dopant in the bands 520-530 nm and 540-550 nm was registered at samples' temperature from the room one to 150°C. The spectra obtained allowed calculating the fluorescence intensity ratio and the sensitivity of temperature measurement. Fluorescence intensity ratio was found to be several times larger for crystalline samples compared to nano-glass-ceramics ones.

The sensitivity is the key parameter of a FIR sensor. It shows relative change of intensity ratio at the temperature rise 1°C. The sensitivity calculated is about 0.005 – 0.011 K^{-1} for $YGdVO_4$ and YVO_4 crystals, 0.004 - 0.006 K^{-1} for the first nano-glass-ceramics sample and 0.004 - 0.012 K^{-1} for the second nano-glass-ceramics sample.

Consequently in spite of significant difference in fluorescence intensity ratio the second nano-glass-ceramics sample is close to crystalline samples by the temperature measurement sensitivity. Nonetheless the second glass-ceramics sample with the same composition but different dopant concentration and secondary heat-treatment time is substantially inferior both by sensitivity and intensity ratio value. So it can be concluded that the selection of nano-glass-ceramics composition, doping sort and concentration and secondary heat treatment regime would allow achieving temperature sensing performance comparable to doped crystals.

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PI - 07

OPTO-ACOUSTIC METHOD OF INCREASING THE EFFICIENCY OF PHOTODYNAMIC THERAPY OF SOLID TUMORS

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Abstract.

New opto-acoustic method of cancer tissue oxygenation for increasing the efficiency of Photodynamic therapy of solid tumor is presented. It is experimentally in vivo shown that application of combined opto-acoustic method of tissue oxygenation at list two times increases local oxygen concentration directly at the zone of application.

The results of investigation of tissue oxygenation by combination of opto-acoustic method with the phenomenon of laser-induced photodissociation of blood oxyhemoglobin are presented. Application of proposed methods in modern oncology for increasing the efficiency of cancer treatment is discussed.

Photodissociation of HbO_2 induced by laser radiation and release rate of free molecular oxygen into blood plasma has been measured experimentally in vivo using high sensitive oxygen monitor. For this purposes transcutaneous oxygen monitor (TCOM) - "Radiometer" TCM-4 has been used. It is experimentally shown that the response of oxygen release on laser irradiation is relatively fast and remains constant during the irradiation. To simulate this effect acoustic method was additionally applied.

Oxygen released from HbO_2 primarily increases the PO_2 of blood plasma and then O_2 diffuses into a tissue. This effect could be enhanced by applying the method of acoustic - ultrasound vibration. This method enhances blood microcirculation and in combination with the method of laser-induced tissue oxygenation allows significantly increase the value of local tissue oxygen concentration. The results of in vivo investigation the phenomenon of laser-induced photodissociation of blood oxyhemoglobin and its biomedical applications are presented.

Different clinical application of developed method is discussed.

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PI - 08

RESIDUAL RARE-EARTH IONS AS AN ORIGIN OF UP-CONVERSION PROCESSES IN KGW CRYSTAL AT THE DIODE LASER PUMPING

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Abstract.
Crystal of potassium gadolinium tungstate is an attractive host for laser medium and often used in Raman lasers. The special attention to optical properties of this crystal is paid in continuous –wave regime of Raman lasers operation, where optical losses are of importance. These losses can be of passive and active origins.

In this report, we consider one of sources of active losses manifesting as an up-conversion process on residual rare-earth ions in KGW [1]. We present new data on concentration measurements of residual Erbium ions in KGW and up-conversion effect in these conditions.

The values of Er-ion concentrations were obtained by relation measurements of integral intensity in 540 – 560 nm band of green luminescence for undoped crystals and doped crystal with 1% concentration of Er ions, excited by Ar-ion laser radiation at 488 nm, respective the $^4I_{15/2} \rightarrow {}^4F_{7/2}$ transition. It was found, that the possible concentration of Er ions impurities can be less than $5\text{x}10^{-5}$ wt%. Multiphoton absorption is usually responsible for the up-conversion effects. Measured dependence of the green and red emissions intensity on the diode laser power for one of examples is shown in (Figure) and gives information about multiphoton absorption.

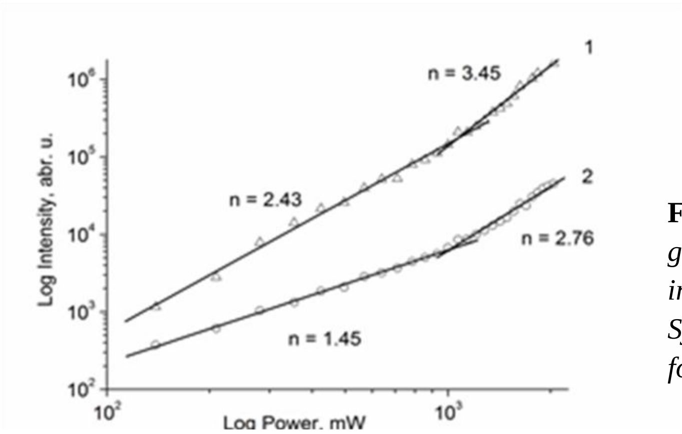

Fig. *Log-log dependence of the green (1) and red (2) emissions intensity on diode laser power. Symbols are experimental data for the 970 nm pumping.*

Excited state absorption is considered as the main mechanism responsible for up-conversion at low RE ions concentrations.

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PI - 09

GROWTH AND RAMAN SPECTRA OF $Ca_{10}Me(VO_4)_7$ (Me = Li, Na, K) CRYSTALS

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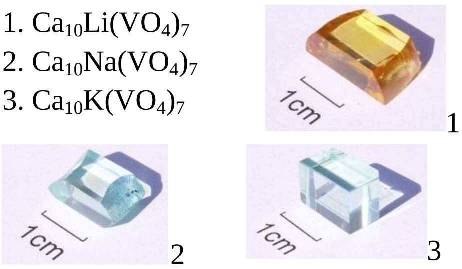
Abstract.

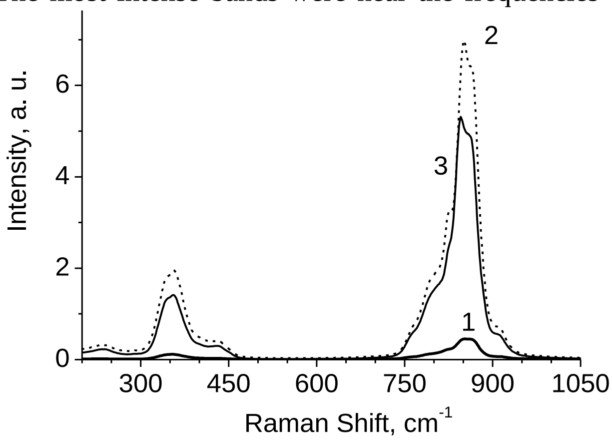
Nowadays the $Ca_{10}Me(VO_4)_7$ (Me = Li, Na, K) crystals with optical nonlinearity are studied with the goal to obtain new promising nonlinear media for intra- and extra-cavity frequency conversion and active media for lasers. The crystal growth of these crystals was carried out by the Czochralski method in argon or nitrogen atmosphere from Ir crucibles (∅=60 mm, h=70 mm) by means of “Kristall 3M” and “Analog” setups with inductive heating and an automated control diameter system of growing crystal along the crystallographic axis [001]. The pulling changed within 1–5 mm/h and the rotational speed was varied in the range of 5– 25 rpm. When using both active and passive afterheaters, the radial temperature gradient on the melt surface did not exceed 0.5°C/mm; the axial temperature gradient at the melt–argon interface was 75°C/cm. The crystal–melt interface was slightly convex. According to the data of chemical analysis, the total concentration of uncontrolled impurities in each crystal did not exceed 2 – $3x10^{-3}$ mass %. The typical crystal diameter and length were up to 25 mm and 60 mm, respectively. All crystals were free of impurity phases. To remove thermoelastic stresses, the grown crystals were annealed at 1300 K in air during 12 hours.

1. $Ca_{10}Li(VO_4)_7$
2. $Ca_{10}Na(VO_4)_7$
3. $Ca_{10}K(VO_4)_7$



Examples of crystal samples

The crystals were investigated by the method of spontaneous Raman-scattering spectroscopy. The results of measurements have confirmed that the crystals under investigation are isotropic. The spatial homogeneity of the $Ca_{10}Na(VO_4)_7$ crystal was best. Spontaneous Raman scattering spectra of these crystals are characterized by two groups of vibrations combined into broad bands ($\Delta\nu \approx 44$ and 55 cm^{-1}). The most intense bands were near the frequencies of 765, 789, 803, 827, 851, 865 and 911 cm^{-1} which are related to the vibrations of $[VO_4]$ groups. Due to the obtained characteristics of Raman spectra these crystals may be of interest to stimulated Raman scattering (SRS) frequency conversion in new spectral ranges, unrealizable in ordinary solid-state lasers, for generation of harmonics with soft phase-matching conditions, and other nonlinear optical applications, as well as laser media when doped crystals of the rare earth elements.



Raman spectra of $Ca_{10}Me(VO_4)_7$ (Me = Li (1), Na (2), K (3)) crystals

PI - 10

ANTI-STOKES AND STOKES PULSE GENERATION IN RAMAN MICROCHIP LASER: EXPERIMENT AND MODELING

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Abstract.

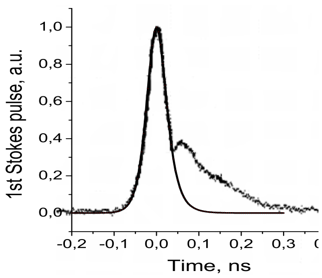

Fig.1 *1st Stokes pulse. T_{ini}=78%*

Due to intensive development of compact solid-state Raman lasers the effect of stimulated Raman scattering (SRS) received new opportunities for manifestation its features and advantages. Attaining a high intracavity peak power in the fundamental and 1st Stokes wave enables the intracavity generation of pulses of higher-order Stokes waves, to whose rise and amplification both two-photon processes and parametric multiwave mixing will contribute. In compact lasers, because of the high intracavity powers, the small beam spots, and the high efficiency of SRS, the conditions for Raman medium excitation and, perhaps, anti-Stokes wave generation due to the parametric and cascade processes could, in principle, be realized. In [1] along with high-intensity 1st Stokes radiation the anti-Stokes and 2nd Stokes radiation has been already recorded in a spectrum of a Nd:LSB/$Ba(NO_3)_2$/Cr:YAG microchip Raman laser. Figure 1 shows (dots) the experimental 1st Stokes pulse generated in the laser with an absorber having 78%–initial transmittance (T_{ini}). The pulse duration was as short as ≈50 ps. For the laser with a 83% absorber the 1st Stokes pulses were 100 to 120 ps long. The dependences of an output power, duration, repetition rate, and pulse energy on pump power of this laser are presented in Fig.2 (dots). To describe the obtained experimental results we proposed a semiclassical theory of intracavity SRS [2]. Starting from the nonlinear wave equation for waves and the equations of motion for a Raman medium the rate equations for SRS of fundamental wave into Stokes and anti-Stokes waves including those of several orders accompanied by transient multiwave mixing and Raman medium excitation in compact lasers have been formulated in terms of slowly varying amplitudes and rotating wave approximations. The results of modeling of pulse generation are shown in Fig.1 and 2 (solid lines). The results of modeling agree well with the experimental data and show that anti-Stokes radiation was due to the multiwave mixing.

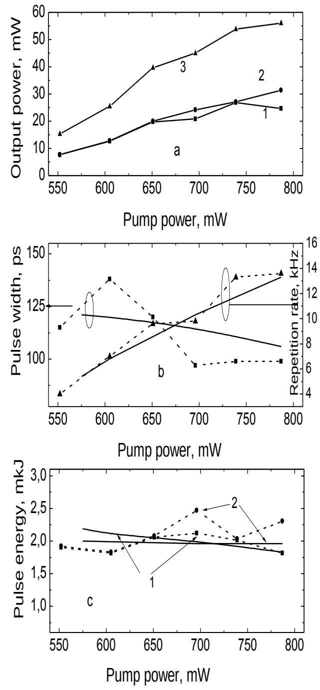

Fig.2. *1st Stokes pulse. T_{ini}=83%*

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PI - 11

PHOTOINACTIVATION OF BACTERIAL CELLS BY OPTICAL RADIATION OF VISIBLE SPECTRAL REGION

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Abstract.
The aim of present work was to investigate the regularities of inactivation and growth inhibition of bacteria *Enterococcus faecalis* (Gram-positive enterococci, subclass of lactic bacteria) due to the exposure to optical radiation of visible spectral region in the absence of exogenous photosensitizers as well as upon sensitization of cells by photodynamically active medicinal drugs approved for clinical practice.
Five cultures of clinically isolated enterococci *E. faecalis* with mandatory testing of culture purity and main biochemical generic and specific features were used in experiments. Studies have shown that exposure to radiation both blue (λ = 405 nm) and red (λ = 665 nm) spectral regions is able to inactivate bacterial cells (exposure dose E = 1-10 J/cm^2). Measurements of suspension temperature immediately after irradiation of cells with power density 100 mW/cm^2 using a thermocouple showed that the rise in temperature due to irradiation does not exceed 1.0ºC. Therefore, the observed effect of *E. faecalis* photoinactivation has not thermal but photochemical nature. It was expressed assumption in the literature that photodamage of bacterial cells upon exposure to radiation of visible spectral region could be explained by sensitized reactions involving endogenous metal-free porphyrins (uro- and coproporphyrins). Indeed, upon excitation of bacterial suspension *E. faecalis* with laser radiation with λ = 405 nm we were managed to detect porphyrin fluorescence with a maximum in the region of 615-620 nm. Note that maxima in absorption spectrum of an aqueous solution of coproporphyrin III are at 404, 500, 535, 555 and 605 nm. When emission wavelength is shifted from maximum of Soret band (404 nm) to long wavelength region it is observed a rapid decrease in optical density of coproporphyrin III with a pronounced minimum in the region of 450-460 nm. There are grounds to believe that a certain contribution to the effect of destruction of *E. faecalis* using radiation of violet-blue spectral region make the reactions sensitized with endogenous flavin-containing compounds. We can not exclude also possible role in photoinactivation of bacteria of destruction of cytochrome enzymes with pronounced absorption in visible and near IR spectral regions. This in particular is confirmed by reliably observed inactivation of bacterial cells upon exposure to radiation with λ = 665 nm locating outside absorption band of copro- and uroporphyrins.

Our studies showed a sharp increase in susceptibility of bacterial cells to action of light in the presence of medicinal drugs commonly used (under dark conditions) as antibacterial agents such as furacilin and diahyperon. It is shown that, due to the ability of mentioned drugs act as photosensitizers, exposure to the light corresponding to their absorption bands causes a rapid inhibition of growth of bacteria *E. faecalis.*

PI - 12

PHOSPHORESCENCE OF BILIRUBIN

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Abstract.

Unsuccessful attempts to detect phosphorescence of bilirubin have lasted for over period 40 years (Cu, 1974, Bonnett, 1975; Matheson, 1975; Barber 1977; Dalton, 1979; Greene, 1981; Lamola, 1985, Plavskii, 2012). The problem is caused by a very low value of quantum yield to triplet state for bilirubin molecules (φ_{isc} ~ 0.005-0.05) as well as by intensive low-temperature fluorescence of the pigment, against of background of which to detect very weak phosphorescence was very problematic even when using the laser excitation.

Thereupon, we have decided to undertake studies of phosphorescence with using classic phosphoroscope enabling to cut off intensive fluorescence of nanosecond range. To increase the intensity of the excitation the continuous-wave semiconductor lasers with λ = 405 and 445 nm, output power ~ 100 mW were used. To exclude photolysis of bilirubin its irradiation was carried out only after samples cooling to the temperature of 77 K. Both laser sources and xenon lamp, the required spectral interval from its emission spectrum was isolated with a monochromator, were used for excitation of low-temperature fluorescence. 2-Methyltetrahydrofuran, Triton X-100, N,N-Dimethylformamide, Dimethyl sulfoxide, buffer solutions of HSA were used as solvents.

In this work we, for the first time, have detected the phosphorescence of bilirubin. It was detected at the temperature of 77 K and laser excitation against of background of intensive fluorescence (quantum yield in 2-Methyltetrahydrofuran is φ_{fl} ~0.36, τ = 2-3 ns, λ_{max} = 502 nm) in all aforementioned solvents with exception of bilirubin-albumin complex. The first maxima in phosphorescence spectra are in the region of 762 nm (Dimethyl sulfoxide); 768 nm (2-Methyltetrahydrofuran), 772 nm (N,N-Dimethylformamide), 774 nm (Triton X-100).

Relevance of ascription of detected luminescence to phosphorescence of bilirubin (but not to luminescence of uncontrolled impurities) is confirmed by increase of its intensity when changing laser excitation with λ = 405 nm (corresponds to short-wave slope of absorption band of bilirubin) to λ = 445 nm (corresponds to the maximum of absorption band of the pigment). Furthermore, according to our data, the energy of the triplet state of bilirubin is $E_T \approx$ 155 kJ/mole as it in good accordance with value $E_T \approx$ 150 kJ/mole obtained from literature under control triplet-triplet transfer with the use of laser flash-photolysis method. It was found that quantum yield of phosphorescence of bilirubin in 2-Methyltetrahydrofuran is $\varphi_{ph} \sim 6.7 \cdot 10^{-6}$, τ ~ 100 μs. Freezing the solutions leads to reversible changes in the spectral characteristics of the pigment.

It is shown that, as the triplet (T_1) state of bilirubin is located above the S_1-level of oxygen (E_Δ = 94.3 kJ/mole), it is provided the possibility of bilirubin-sensitized generation of singlet oxygen. At the same time, taking into account that the energy of singlet-triplet splitting for pigment molecule ΔE = 82-89 kJ/mole is less than E_Δ = 94.3 kJ/mole, it excludes possibility of sensitized formation of singlet oxygen from S_1-level of bilirubin.

PI - 13

REGULATORY BIOLOGICAL ACTION OF CONTINUOUS, QUASI-CONTINUOUS AND PULSED LASER RADIATION OF NANO-AND PICOSECOND RANGES

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Abstract.
In this work, for the first time, comparative studies of biological activity of low intensity continuous, quasi-continuous and pulsed laser radiation of nano- and picosecond time ranges with the same average power density (3,0 mW/cm^2) are carried out. Zooplankton (branchiopod crustaceans) *Artemia salina L.* and sturgeon sperm were used as objects. As a test, to check the action of laser radiation, percentage of nauplii hatched from cysts (protective shells) after activation of eggs in salt water in a stable thermal regime was chosen. The indicators of biological action on fish sperm were the data on duration of sperm motility as well as their curvilinear velocity after activation with water. Analysis of motility parameters was performed programmatically based on an assessment of their trajectory. The value of photobiological effect (dose curve) was evaluated in comparison with control intact objects. The exposure was realized using the second-harmonic radiation (wavelength – 532 nm, average output power ~30 mW) of Nd:YAG-lasers working in continuous and quasi-continuous (pulse repetition rate – F = 1 kHz, pulse duration – τ = 100 ns) modes, as well as in pulsed mode with generation of nanosecond (τ = 15 ns, F = 10 Hz) and picosecond (τ = 60 ps, F = 20 Hz) pulses. Comparative studies upon exposure to radiation of red spectral region (superbright LEDs, λ = 632 nm, power density – 3 mW/cm^2) were also carried out.

It is shown, for the first time, that, despite the significant differences in peak values of intensity of acting factor, both continuous and quasi-continuous radiation and radiation of nano- and picosecond ranges are able to have both stimulating and inhibiting effects on all investigated parameters of functional activity of biological systems in a certain range of dose rates. For example, using the aforementioned parameters of acting factors the optimal stimulating dose when controlling the sperm motility is 135 mJ/cm^2 for continuous radiation; 90 mJ/cm^2 - for quasi-continuous and nanosecond and 60 mJ/cm^2 – for picosecond radiation. At the same time, maximal stimulating effect (compared to the control) is 140±6% for continuous; 163±9 % –for quasi-continuous; 122±6 % – for nanosecond and 115±7 % – for picosecond modes. Even more pronounced stimulating effect (180±9 %) has a continuous radiation of red spectral region.

It is typical that stimulating effect in the case of nano- and picosecond modes is observed in a very narrow dose interval: 30–60 mJ/cm^2. The rapid suppression of functional characteristics of biological systems is observed upon increasing the dose: at a dose of 1.8 J/cm^2 duration of sperm motility reduced more than two times compared to the control. Similar bell-shaped dose curves are registered when controlling the curvilinear sperm velocity and percentage of nauplii hatched from cysts after activation of eggs in salt. This type of dose curves testifies to “soft” regulatory nature of biological action of laser radiation. On the other hand, similar nature of dose curves upon control of functional characteristics differing in their structural organization of biological systems (zooplankton and fish sperm) is evidence of biological significance of the results obtained.

PI - 14

FLUORESCENCE OF BILIRUBIN AT ROOM TEMPERATURE AND TEMPERATURE OF LIQUID NITROGEN

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Abstract.

The aim of this work was to investigate the spectral-luminescent characteristics of Z,Z-bilirubin IXα in liquid solutions at room temperature (293 K) as well as in rigid glass media at temperature of liquid nitrogen (77 K).

For the first time, we have detected a sufficiently intensive fluorescence of bilirubin dissolved in nonionic surface active agent – Triton X 100. Mentioned detergent has in its structure hydrophobic and hydrophilic fragments and it is a very viscous compound at room temperature. Maximum in absorption spectrum of bilirubin for Triton X 100 is at 462 nm, fluorescence is at 515 nm. Quantum yield of fluorescence of bilirubin in Triton X 100 ($\varphi \cdot = 1.2 \cdot 10^{-2}$) is in 75 times higher than the corresponding value in chloroform ($\varphi \cdot = 1.6 \cdot 10^{-4}$) and in 4 times ($\varphi \cdot = 3 \cdot 10^{-3}$) – in a complex with human serum albumin (site with the highest association constant). It is typical that bilirubin localized in the second site of strong binding of HSA practically does not fluoresce at t = 293 K.

Fluorescence decay rate of bilirubin in Triton X 100, as well as in other solvents at room temperature is abnormally low and it is τ<100 ps. According to the literature data, even lower value τ is typical for bilirubin in complex with HSA (τ < 80 fs). It is shown that the reason for weak fluorescence of bilirubin solutions at room temperature is rotational mobility of outer pyrrole rings of the molecule. Hence, in rigid glass media (77 K), limiting the rotational mobility of molecules and their fragments, one should occur a sharp increase in quantum yield and fluorescence decay rate. The experiment was fully confirmed said. Studies have shown that quantum yield of luminescence of bilirubin increased more than three orders of magnitude upon freezing. So, if quantum yield of fluorescence for bilirubin in 2- Methyltetrahydrofuran at room temperature is $\varphi \cdot \approx 1 \cdot 10^{-4}$ then efficacy of its luminescence at temperature of liquid nitrogen is $\varphi \cdot = 0.36$. The high value of the quantum yield of the low-temperature luminescence allows us to conclude that mentioned luminescence can be attributed to the fluorescence of bilirubin as phosphorescence quantum yield must not exceed the value of quantum yield to the triplet state φ = 0.005-0.05.The measurement of low-temperature (77 K) bilirubin luminescence decay rate (τ) in 2-Methyltetrahydrofuran and Triton X-100 upon excitation with λ_{ex} = 408 nm showed that τ values are in nanosecond range (2 – 3 ns).

For the first time, we have detected the low temperature fluorescence of bilirubin, localized in the second site of strong binding on the molecule of human serum albumin. Thus, the fluorescence of bilirubin at temperature 77 K localized in the site of strong HSA binding (bilirubin/HSA ratio = 1/2) is characterized by λ_{max} = 529 nm and half-width of $\Delta\lambda$ = 75 nm. Upon binding of two molecules of bilirubin with HSA their maximum fluorescence is at λ_{max} = 537 nm and $\Delta\lambda$ = 85 nm.

PI - 15

DETERMINATION OF HEAVY METALS BY SURFACE-ENHANCED RAMAN SCATTERING: A CASE OF ANTIMONY DETECTION

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Abstract.

Heavy metals are ubiquitously present in the environment as a result of natural processes as well as due to undue deposition agricultural, industrial and urban wastes. Water contamination by heavy metals is a common problem encountered in many countries since they have a tendency to accumulate in living organisms and can be considered as hazardous substances. Therefore, there is a need for a fast, reliable and highly sensitive methods for continuous detection and monitoring of toxic heavy metal levels in soil and water resources. Until now, a variety of techniques for the analysis of metal traces have been established, such as spectrophotometry, atomic absorption and fluorescence spectrometry, inductively coupled plasma-optical emission, mass spectrometry and etc.

Most of the above methods are characterized by high efficiency, improved selectivity, need low sample volume, low reagent consumption. However, all these techniques are costly, require trained personnel and are not applicable for the rapid detection of heavy metal in the sample. Recently, using antimony as an example, we have developed a new method of detection of micro-quantities of heavy metals, which is based on the use of the surface enhanced Raman scattering (SERS). SERS spectroscopy is characterized by an extremely high sensitivity, which is achieved as a result of a considerable increase in the Raman scattering cross section for molecules that are adsorbed on the surface of SERS-active substrates; i.e., materials that contain nanosized surface irregularities or films of nanoparticles of noble metals. At present, we have developed a technique of preparation of these substrates based on silvered porous silicon (Ag–PSi), which ensure a high level of enhancement of the SERS signal [1]. In the approach that we propose, the content of antimony is analyzed from the SERS spectra of its complex with phenylfluorone (Sb–PF), since this organic reagent is widely used in photometric techniques of determining metals of the III–VI groups. Samples for the measurement of SERS spectra were obtained by deposition of an organometallic complex from a solution to a nanostructured silver surface.

The method is characterized by high selectively owing to the unique SERS fingerprint peaks and due to the resonance character of excitation. Our results show that due to high SERS sensitivity a very low amount of antimony (~50 pg) can be detected. This corresponds to an equivalent volume of 50 μl of Sb-PhF solution with Sb mass concentration of 1 ng/ml.

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PI - 16

INVESTIGATION OF RAMAN SPECTRA AND OPTICAL DENSITY OF BLOOD AT CYCLOCITIDINE AND LASER IRRADIATION INFLUENCE ON TUMOR PROCESS

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Abstact.

Raman spectroscopy is widely used in a variety of analytical studies of blood, including investigations of neoplastic processes.

The object of the study was to reveal the peculiarities of manifestation in Raman and absorption spectra of blood of therapeutic factors influence on tumor's development, including laser radiation influence.

Studies were conducted on mice with implanted Ehrlich carcinoma. As medical factors the cytostatic anticancer drug cyclocitidine in injectable form and laser irradiation (course of treatment, laser diode, wavelength of 470 nm at laser power of 5 mW) were used.

It was established that course of cyclocitidine treatment resulted in significant decrease of tumor mass almost by half (by 55 %, significance level $p < 0.05$). Almost the same reduction of tumor mass (by 48%, $p < 0.05$) was revealed only when exposed to laser radiation of blue spectral region.

Recording of Raman spectra of blood of experimental animals was carried out in the range of 700 - 2000 cm^{-1} frequency shifts when excited by continuous wave radiation at the wavelength of 441.6 nm. For Raman spectra analysis the most intense lines corresponding to frequency shifts ~ 1130 ~ 1357 ~ 1580 and ~ 1620 cm^{-1} were selected. These lines are associated with vibrations in glucose molecules (~ 1130 cm^{-1}) and hemoglobin, at that Raman shift of ~ 1580 cm^{-1} is due to oxyhemoglobin , and lines ~ 1357 cm^{-1} and ~ 1620 cm^{-1} belong to deoxyhemoglobin [1]. In addition to Raman spectra the broadband optical density spectra of blood of mice with carcinoma and cyclocitidine treatment were studied.

It was determined that cytostatic effect of cyclocitidine is significantly manifested in Raman spectra and optical density spectra of blood. The decrease of relative intensities of spectral components associated with oxy-(1580 cm^{-1}) and deoxyhemoglobin (1620 cm^{-1}) was reliably revealed. In optical density spectra of after their processing by the method of principal components the clustering of images of samples on the basis of cyclocitidine presence and absence in blood was observed. Antitumor effect of blue laser radiation (~ 470 nm) is confirmed by the identity of the corresponding Raman spectra and Raman spectra of the control group.

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PI - 17

PROBING THE SURFACE-ENHANCED RAMAN SCATTERING PROPERTIES OF THE NOBLE METAL NANOPARTICLES SYNTHESIZED USING BIOPOLYMER PECTIN

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Abstract.

During the last decade great attention was given to the research in the field of nanoscience and nanotechnology. Nanosized particles posses quite a number of unique properties, which give much potential for the development of a new approaches in biomedicine, ecology and etc. Increasing number of applications of nanotechnologies requires design of novel preparation methods of nanoparticles-based materials. Commonly used chemical approaches are via reduction of metal ions by different reducing agents in solution. However, most of the chemical methods use highly reactive hazardous chemicals that may not be environmentally friendly. The preparation of the metal nanoparticles (NP), especially in industrial amounts, using present chemical procedures would cause a significant damage to the environment. There why the development of new “green” NPs synthesis methods, which utilize environmentally acceptable solvents, reducing and stabilization agents is the problem of crucial importance.

We have developed a simple and efficient method to obtain Au and Ag NPs using non-toxic biopolymer pectin. Pectin is a naturally occurring biopolymer, which is considerably distributed in the peels of apple, citrus fruits and in some vegetables. It is used in food as a gelling, and stabilizing agent and also widely applied in pharmaceutical industries for the controlled release of drugs. Structurally pectin is a liner polysaccharide consisting of D-galacturonic acid units joined in chain by means of α-(1-4) glycosidic linkage. Due to its physic-chemical properties pectin can serve both as reducing and stabilizing agent in metal ions reduction procedure. Therefore by using of pectin it is possible to form metal NPs in one step without addition any other toxic chemicals. It was established that concentration of pectin is a main parameter, which affects size, shape and aggregation of synthesized nanostructures.

SERS activity of obtained noble metal NPs was studied using water-soluble Cu-complex of cationic tetrakis (4-N-methylpyridyl) porphyrin (CuTMPyP4) as an analyte. It was found from the comparison of the SERS spectra for gold nanoparticles synthesized both chemical and pectin based procedure that the pectin-Au NPs demonstrate very low SERS efficiency. At the same time the rather high enhancement of the Raman signal was obtained with a pectin-Ag NPs and for most of the pectin concentrations used at silver reduction its level was higher than that for the routinely synthesized citrate-Ag nanoparticles.

PI - 18

ENTROPIC MEASURE OF DISORDER FOR THE SYSTEM OF TWO-LEVEL ATOMS PLACED IN TWO-DIMENSIONAL CAVITY

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Abstract.

As it has been emphasized in our previous papers [1-3], the cellular automata (CA) formalism is very useful in simulation of the dynamics of large systems, when the number of differential equations describing these systems become too large. By CA method, some relatively simple local interactions could lead to interesting phenomena concerning dynamics of the given system.

In this paper, we will continue these considerations by using the introduced in [1-2] so-called entropic measure as an effective parameter characterizing the spreading of disorder in the system. It will be shown that as for the one-dimensional case the entropic measure undergoes a saturation, whereas the entropy normalized by the total number of excitations grows exponentially.

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PI - 19

TEMPERATURE AND EXCITATION POWER – DEPENDENCE OF PHOTOLUMINESCENCE SPECTRA IN GaAs/Al_xGa_{1-x}As ASYMMETRIC DOUBLE QUANTUM WELLS

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Abstract.

In this work, the temperature and excitation power – dependence of the photoluminescence (PL) spectra of GaAs/Al_xGa_{1-x}As asymmetric double quantum wells (DQWs) were investigated. The coupled and uncoupled asymmetric DQWs were grown via Molecular Beam Epitaxy (MBE). The coupled DQW consists of a 48 Å GaAs narrow well (NW) separated from a 90 Å wide well (WW) by a 25 Å Al_xGa_{1-x}As barrier. Meanwhile, the uncoupled DQW consists of a 53 Å GaAs NW separated from a 90 Å GaAs WW by a 100 Å Al_xGa_{1-x}As barrier. Distinct peaks corresponding to the NW first conduction band to first heavy hole subband (C1-HH1), first conduction band to first light hole subband (NW C1-LH1), WW first conduction band to first heavy hole subband (C1-HH1) and WW first conduction band to first light hole subband (C1-LH1) transitions were observed for both DQWs using PL spectroscopy at room-temperature. The samples were then loaded to the cold finger of a closed - cycle cryostat and temperature – dependent PL spectroscopy was performed from 11 K to 150 K. The NW transitions are not evident at low – temperatures because carriers in the NW have higher energies than carriers in the WW and are able to tunnel and recombine into the wide well. The latter was not observed in the uncoupled DQW, suggesting that the 100 Å Al_xGa_{1-x}As barrier was thick enough to prevent tunneling. Temperature – dependent PL results show that peaks of the DQWs follow a temperature – dependence similar to its bulk GaAs counterpart, as described by the Varshni equation. Excitation – power dependent PL spectroscopy from 12mW to 70mW was performed at 11 K to further investigate tunneling in the DQWs. Results show that the WW C1-HH1 and NW C1-HH1 intensity ratio of the coupled DQW decreases drastically as excitation power increases while the intensity ratio for the uncoupled DQW remains constant. Increase in the excitation power cause an increase in the number of photo-generated carriers for both DQWs. However, for the coupled DQW, carriers in the NW could recombine within the NW or tunnel into the Al_xGa_{1-x}As barrier and recombine with the carriers in the WW. These result to a decrease in intensity of the NW C1-HH1 transition and a corresponding increase in the WW C1-HH1 transition.

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PI - 20

PHOTOLUMINESCENCE AND ELECTRON MICROSCOPY STUDY OF PbS NANOPARTICLES PREPARED BY THE LASER ABLATION AND PERSPECTIVES FOR PHOTONIC APPLICATIONS

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Abstract.

We compare the optical properties of PbS quantum dots prepared by Langmuir–Blodget method in the form of thin films on glass substrates with the optical properties of the PbS thin films prepared by the reactive laser ablation. We optimized the reactive laser ablation as well as the optical setup for the steady-state photoluminescence measurements in the near infrared spectral range 850–1600 nm.

We present the spectrally corrected and normalized infrared photoluminescence spectra of PbS nanoparticles together with their scanning electron microscopy (SEM) images and show the influence of the post-deposition processing on enhancing the infrared photoluminescence quantum yield.As well as we present first results on the structures of a-Si:H thin films with embedded PbS nanoparticles and their perspectives for photonic application.

We acknowledge the projects MEYS KONTAKT II grants nr. LH12236, the project LD14011 (HINT COST Action MP1202) and the project Nanointegration: CZ.1.07/2.3.00/20.0306.

PI - 21

KINETICS OF PHOTOLUMINESCENCE FROM CdS NANOCRYSTALS FORMED BY LANGMUIR-BLODGETT TECHNIQUE

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Abstract.

Photoluminescence kinetics of CdS nanocrystals obtained by the Langmuir-Blodgett technique [1] at a temperature of 5 K has been investigated. The photoluminescence kinetics was described by biexponential function with characteristic times of about 30 and 160 nsec. It was found that fast and slow decay time increases with the size of the nanocrystals. Analysis of the experimental data has shown that the fast decay time is determined by recombination of trions [2] and the slow decay time by the recombination of optically passive excitons [3]. Trions are formed in nanocrystals with point defects, the dark exciton recombines in crystals without the defects. It was established that the portion of defective nanocrystals decreases with the reducing size of nanocrystals due to self-purification effect [4].

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PI - 22

EFFECT OF THE POLARIZATION CHARGES AT THE INTERFACES OF THE $Al_xGa_{1-x}N$/GaN QUANTUM WELLS ON THE OPTICAL ABSORPTION

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Abstract

Spontaneous and piezoelectric polarization are known to be the key effect on the electronic and optical properties of polar heterostructures. This effect modifies the electronic states and optical absorption spectrum. We present variational calculations of the eigenstates and transition energy of the electron-hole in an isolated-quantum-well for the moderate piezoelectric fields and strong piezoelectric fields. The redshifts of the absorption spectrum peeks by the first bound state electron-hole transition are explained using a triangular potential instead of a square one. The energy calculations between the electron-hole pair as a function of the well width and Al content were done.

GaN-based quantum wells (QWs) have been successfully applied in visible and UV light emitting devices and in high power, high temperature electronics. On the photonics side, the AlGaInN materials system, consisting of AlGaN/GaN, InAlN/GaN, and InGaN/GaN heterostructures and the GaN, AlN, and InN binaries, is widely used in blue/violet/white/UV light emitting diodes for stoplights and full color displays, blue and green lasers for use in high-density CD-ROM storage and high-resolution printers [1, 2]. The group-III nitrides in the wurzite phase have a strong spontaneous macroscopic polarization and large piezoelectric coefficients [3]. The abrupt variation of the polarization at the surfaces and interfaces gives rise to a large polarization sheet of charges that in turn create the large internal electric fields. In previous study, we studied the strong electrons confinement due to spontaneous polarization charges on the surface [4] and the electron scattering from polarization charges bound on a rough interface of polar heterostructures [5, 6] by variational calculations.

In this work, we present an consideration the energy shift due to the presence of internal electric field in the QW. The electron-hole transition energy in the QW is calculated using the variational electron and hole wave functions. Under these approximations, we calculated the transition energy between the electron-hole pair as a function of the well width and Al content in the AlGaN/GaN single quantum wells.

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PI - 23

OPTICAL PROPERTIES OF MATERIALS: TWO DIFFERENT CALCULATING APPROACHES

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Abstract.

In this work, we show that the optical properties of materials can be calculated using two different methods, that is time-dependent density functional theory (TDDFT) and many-body perturbation theory (MBPT). On the one hand, for TDDFT, the random phase approximation (RPA) and time-dependent local-density approximation (TDLDA) may be applied to simplify the problems. On the other hand, many-body effects may be treated within the Bethe-Salpeter equation (BSE) framework. Moreover, we calculated the absorption spectrum of Cadmium fluoride with different schemes to obtain the best agreement with experimental data.

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PI - 24

MULTIPLE ACOUSTIC PLASMONS IN OPTICALLY EXCITED SEMICONDUCTORS

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Abstract.

We study the Coulomb quantum kinetics of an electron – hole gas in a semiconductor excited by a coherent femtosecond laser pulse. The nonequilibrium-Green-function method has been used with the full two-time-dependent RPA-screened Coulomb potential. The dependence on wave number and energy of the dielectric function has been calculated. Within this method and approximation, we demonstrate the existence of multiple acoustic plasmons in optically excited semiconductors. We also show that the number of acoustic plasmons can change according to the parameters of the incident laser.

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PI - 25

IMPROVING EFFICIENCY OF SECOND-HARMONIC GENERATION WITH FEMTOSECOND Ti:SAPPHIRE LASER PULSES

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Abstract.

We generated second-harmonic generation (SHG) with 50-fs-duration of laser pulses at a wavelength of 800 nm in the nonlinear crystal BBO. In our experiments we use a commercial oscillator Ti:sapphire that yields pulses with an energy of 6 nJ at a 80-MHz repetition rate. The conversion efficiency of SHG does not exceed 35%. In the theoretical part, we show the condition to obtain maximum conversion efficiency of SHG and how to control the effect of the group-velocity mismatch between the fundamental pules and the harmonic pules. Our results indicate that good thickness of BBO crystal for SHG generation with 50-fs-duration of laser pulses is below 1 mm.

PI - 26

ADDITIONNAL INFORMATION TO OPTICAL SPECTROSCOPIC DATA ON CANCER RESEARCHES WITH NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY

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Abstract.

Nuclear Magnetic Resonance (NMR) spectra have been recorded for urine samples of both male and female colorectal cancerous and healthy persons.

Specific differences have been observed, in particular in the spectral range corresponding to some metabolites. The NMR-based metabolomics approach could help to better understand the data obtained in other spectroscopic studies.

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PI – 27

AUTOFLUORESCENT OF LIVER TISSUE OF CANCER PATIENT

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Abstract.

In this paper, autofluorescence spectra of liver tissues of 5 patients have been measured. The autofluorescence spectra have been studied at different areas of samples: normal tissue area, tumour tissue area and necrotic area. The excitation wavelength is 285 nm, peaks of autofluorescence spectra are at 347 nm and 567 nm. The experiment indicates that the difference of the height of spectrum peaks of the areas can be observed. The height of spectrum peak gradually decreases from the tumour area to the necrotic area. This result is very helpful in diagnosing cancer.

Keywords: *autofluorescence, liver cancer, diagnosing cancer.*

PI - 28

AB-INITIO STUDY ON POINT DEFECT IN Al-, Ta- AND Zn-DOPED SnO_2

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Abstract.

A first-principles GGA/GGA+U calculation for intrinsic point defect (V_O, V_{Sn}, Sn_i) and extrinsic point defect (Al_{Sn}, Ta_{Sn}, Zn_{Sn}) in Al-, Ta-, and Zn- doped SnO_2 were performed on a relaxation supercell contain 48 atoms. The calculations employ the Perdew-Wang (PW91) gradient-corrected functional with the Vanderbilt ultrasoft pseudopotential. From that, the defect energy of formation on condition O-rich and O-poor, the heat of formation, the change in cell parameters, and DOS graph of all structure were calculated. DOS graphs show that V_O, Sn_i and Ta_{Sn} act as donor level while V_{Sn} and Al_{Sn}, Zn_{Sn} act as acceptor level on SnO_2 bandgap, respectively. Other results show the energy of formation of Ta_{Sn} is the lowest for both Oxygen condition and Zn_{Sn} has lowest heat of formation.

PI - 29

OPTICAL PROPERTIES OF ZINC OXIDE QUANTUM DOTS FABRICATER BY SOLGEL METHOD WITH IN-SOLUTION ANNEALING

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Abstract.

ZnO Quantum Dots (QDs) have been synthesized by sol-gel method using triethanolamin (TEA) as inhibitor,and then the solution were annealed at 150ºC for enhancement of crystallinity for many hours. The optical properties of ZnO QDs were examined by Dynamic light scattering (DLS), Photoluminescence (PL), UV-Vis spectrometry.The band gap energy of ZnO QDsis calculated from UV-Vis spectra by Tauc's law and using Coulomb interaction model for determination of the size of quantum dots. The calculated results correspond well with the DLS measurement. Photoluminescence spectra of QDs after annealing showed the changes of defect states and crystallinity of QDs with different annealingtimes. ZnO QDs arevery sustainable, there are no change in their properties after six months.

Keywords: ZnO quantum dots, sol-gel, TEA, photoluminescence.

PI - 30

PHOTOLUMINESCENCE PROPERTIES OF ZnO THIN FILM GROWTH BY ELECTROCHEMICAL METHOD ON MONOLAYER GRAPHENE SHEET

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Abstract.

A dense ZnO thin films were directly grown on single-layer graphene sheets by cathodic reduction electrochemical deposition method in the two-electrode system, without ZnO seed layer, O_2 bubbling, electrolyte assistance or additional etching process [1-2]. The effects of current density, growth temperature, electrolyte concentration and deposition time on ZnO deposition and its luminescent property were investigated in detail [2]. The microstructures of the ZnO thin films could be improved by annealing treatment. X-ray diffraction (XRD) and scanning electron microscope (SEM) measurements were performed to characterize the ZnO films. The results showed that the films were polycrystalline with hexagonal wurtzitetype structure and presented different morphologies, grain size ranging approximately from 180 to 320 nm. ZnO films obtained at 0.75 and 1.25 mA/cm^2 were compact and homogeneous [3]. We can draw the relationship between PL spectra and defect states, morphology and crystallinity of ZnO thin films grown on graphene sheets. The PL spectra are composed of a dominant UV emission and a weak green emission at roomtemperature [4]. The intensities of these peaks change upon current density.

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PI - 31

CONTROLLING GROUP VELOCITY OF LIGHT IN A FIVE-LEVEL CASCADE EIT MEDIUM

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Abstract.

Electromagnetically induced transparency (EIT) is a quantum interference effect which makes a resonance medium become transparent and steeper dispersive for a probe light field under induction of other strong coupling light field. The effect was introduced theoretically in 1990 [1] and experimentally verified in 1991 [2]. Since then, EIT has attracted a tremendous interest over the last years due to its unusual properties and promising potential applications. One of the most promising applications concerning to EIT is slow-light group velocity [3].

In the beginning of studies on this topic, three-level configurations were the main objects giving a narrow spectral in which group-velocity is controlled to slow-down or speed-up. From practical perspective, extension from single to multi-window EIT is currently of interest due to it gains diversifying usefulness. As an example is to simultaneously support slow group velocity for pulses at different frequencies [4, 5] in which light fields has advantage in production of quantum entanglement.

In this work, based on an analytical results obtained in Ref. [6], we derive extensively an analytical expression of group velocity for a weak probe light as a function of controllable parameters of a strong controlling light and temperature. Dependences of group velocity, including group delay, on the controllable parameters are studied in details.

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PI – 32

SURFACE-ENHANCED RAMAN SCATTERING NANOPROBES FOR DETECTION OF MELAMINE

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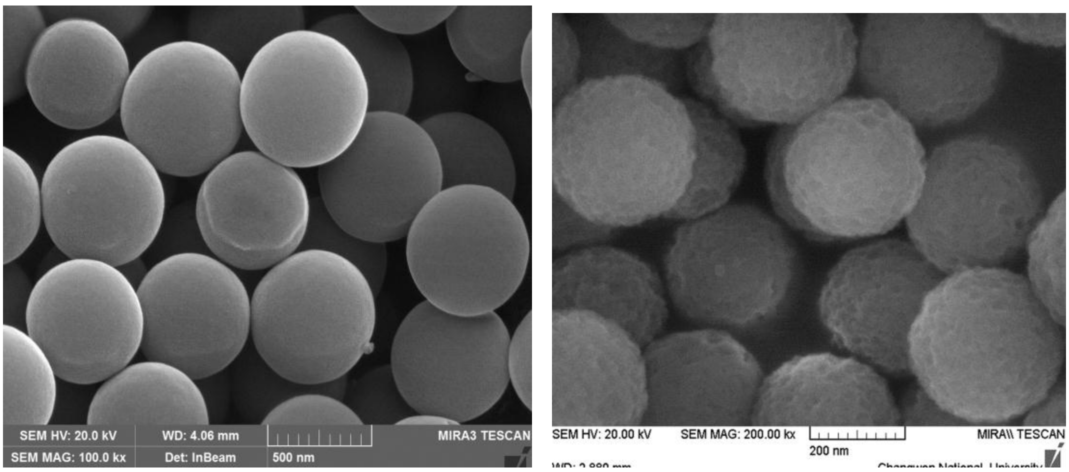
Abstract.

Ag-coated SiO_2 nanoparticles were synthesis by wet-chemical method using a modified Stober method and sol-gel reaction. The products were characterized by scanning electron microscopy (SEM), EDS, transmission electron microscopy (TEM), and UV–visible spectroscopy. The results show that the surface of SiO_2 spheres were coated by Ag and have the grenade form. The variable size of the particles, obtained in a water methanol system, was employed for SERS measurement. It has also been demonstrated that the particle size afffect to SERS signal. Ag-coated SiO_2 nanoparticles were applied fot detecting melamine. The enhanced factor SERS signal of our Ag-coated SiO_2 is about 10^3. This work may provide a potential technique to detect melamine.



a) b)

Fig. 1: *SiO_2 nanoparticles a) and Ag-coated SiO_2 nanoparticles b).*

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JUDD-OFELT ANALYSIS OF SPECTROSCOPIC PROPERTIES OF Sm^{3+} IONS IN K_2GdF_5 SINGLE CRYSTAL

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Abstract.

K_2GdF_5 crystals doped Sm^{3+} ions were synthesized under hydrothermal condition. The absorption, excitation, luminescence spectra and lifetimes of K_2GdF_5:Sm^{3+} was measured at room temperature. The Judd–Ofelt theory has been used to evaluate the three Judd–Ofelt intensity parameters ($\Omega_{2,4,6}$) and calculated oscillator strengths (f_{cal}). Using these JO parameters as well as from the emission, various radiative parameters such as transition probabilities (A_R), radiative lifetime (τ_R), calculated branching ratios (β_R), measured branching ratios (β_{mes}), and stimulated emission cross-sections ($\sigma_{\lambda p}$) have been calculated for $^4G_{5/2}$ excited level. From the emission characteristic parameters of $^4G_{5/2}$ level, it is concluded that the K_2GdF_5:Sm^{3+} crystals could be useful for photonic devices like visible lasers, fluorescent display devices and optical amplifiers.

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EFFECT OF TECHNOLOGICAL CONDITIONS ON OPTICAL PROPERTIES OF $ZnO\text{-}SiO_2$ NANOCOMPOSITES DOPED WITH Eu^{3+} IONS

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Abstract.

In this work, we have studied optical properties and structures of $ZnO\text{-}SiO_2$ nanocomposites doped with Eu^{3+} ions with varied concentrations of ZnO, Eu^{3+} ions and different annealing temperatures. The thin films containing $ZnO\text{-}SiO_2$ nanocomposites doped with Eu^{3+} ions were prepared by sol-gel method and spin-coating process. The structures and morphologies of the thin films as a function of temperature were studied by X-ray diffraction (XDR) and scanning electron microscope (SEM). X-ray patterns indicate that we are only able to observe the formation of ZnO nanocrystals in the sample annealed at the temperature above 1000^{o}C. The dominating of $^5D_0$-$^7F_2$ transition of Eu^{3+} ions at about 613 nm from photoluminescence spectra suggests that Eu^{3+} ions mainly take a site with low symmetry in the $ZnO\text{-}SiO_2$ host. Also, the energy transfer from ZnO nanocrystals to Eu^{3+} ions are observed in photoluminescence excitation spectra with the excitation wavelengths ranging from 250 nm to 450 nm.

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PI - 35

DETERMINATION OF PESTICIDES IN SOLUTIONS USING NANO POROUS SILICON MICROCAVITY SENSORS

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Abstract.

In this work, we report a modified technique for the determination and quantification of Atrazine pesticide presented in water and humic acid solutions using a simple and low cost one dimensional (1D) nano scale Porous Silicon Microcavtiy (PSMC) sensor. Sensor was fabricated on a p+-type silicon substrate by electrochemical anodization method, which can exactly control the porosity and thickness of the porous silicon layers. When 1D-PSMC sensor was exposed to the different concentrations of pesticide solutions, the resonant cavity peak promptly shifted toward longer wavelength. We determined that the red-shift of the resonant cavity peak is caused by the average index change of porous structure due to the capillary infiltration of liquid into pores. Sensor showed an excellent sensing ability under the different concentrations in range from 2 to 22 pgmL-1 of the atrazine pesticide. In addition, the calibration plot of obtained sensor device indicates a good linear relation between the different concentrations of atrazine and the wavelength shift. The 1D-PSMC sensor device can detect and quantify the presence of atrazine pesticide with good sensitivity (0.3 nm/pgmL-1) and limit of detection (LOD) (0.8-1.4 pgmL-1). These results may be heplfully for development of portable devices that can be used for field monitoring by untrained labor.

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PI - 36

A STUDY ON OPTICAL FILTERS USING TWO DIMENSIONAL PHOTONIC CRYSTALS

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Abstract.

In this work, we present the theory and numerical calculations of the optical filters using two dimensional photonic crystals. In particular, we designed two basic kinds of optical filters which are waveguide-cavity-waveguide and side-coupled filters. In addition, the coupling coefficients through the waveguides in two structures were analyzed by using the coupled-mode theory in time. We perform two-dimensional (2-D) finite-difference time-domain simulation to confirm the coupled-mode theory analysis. The transmission spectra and the resonant frequencies in two proposed structures were presented. The results showed the good agreement between the theory and the simulation.

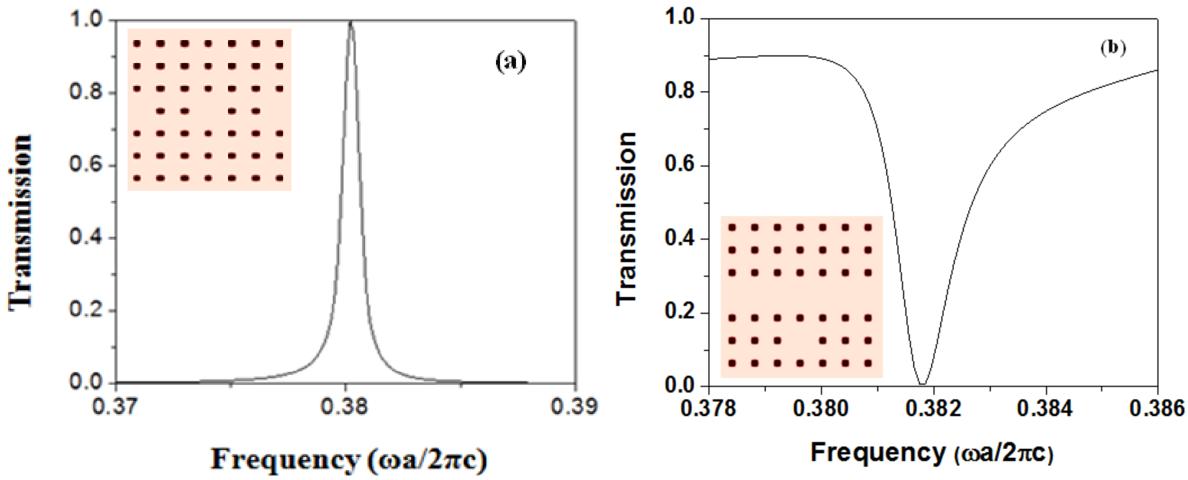

Figure 1: *Transmission spectra in two proposed optical filters. (a) waveguide-cavity-waveguide and (b) side-coupled filters.*

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PI - 37

THE STUDY OF FIBER BRAGG GRATING SENSOR BASED ON SELF-MIXING INTERFEROMETRY FOR STATIC STRAIN MEASUREMENT

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Abstract.

In this paper, an interrogation scheme for a Fiber Bragg Grating (FBG) static strain sensor, which is based on the self-mixing effect in the cavity of Distributed Feedback Laser Diode (DFLD) integrating a photodiode, has been presented. This sensor simply consists of a laser diode and a FBG under static strain which are coupled together. Its operation is based on the interferometry principle of the laser self-mixing in the moderate feedback regime. The laser wavelength is scanned across the extremities of the FBG spectrum by a modulation scheme through the laser driven current. Strain induced shifts of the Bragg grating peak reflectivity, which is back-reflected into the laser cavity and modifies the emission properties of the laser, results in the formation of saw tooth fringes. The longitudinal strain values are directly detected by the saw tooth-like fringes of optical feedback signals. Comparing the obtained experimental results with the directly measured results from the reference gauges strain sensor demonstrated the feasibility of this demodulation technique for static strain measurement.

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PI - 38

RELAXATION DYNAMICS FEATURES OF ELECTRONIC EXCITATION OF GOLD NANOPARTICLE-LIGAND CONJUGATES

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Abstract.

Plasmonic systems based on nanoparticles of noble metals occupy an important place among the other advanced nanomaterials. Plasmonic nanostructures are characterized by strong bands of localized surface plasmon resonance absorption (SPRA) in the optical region of the spectrum. Gold nanoparticles (NPs) have attracted great scientific and technological interest due to their ease of synthesis, chemical stability and unique optical properties. Gold NPs synthesized in water and subsequently linked to biomolecules have many applications in the life sciences, such as drug delivery, genetransfer, bioprobes in cell and tissue analysis and studies of biological processes at the nanoscale [1]. It is well known that the environment can affect not only the stationary spectrum of SPRA, but also the dynamics of the relaxation of a strongly nonequilibrium ensemble of charge carriers resulting from excitation of nanoparticles by ultrashort light pulses [2]. When we excite nanoparticle by femtosecond pulses within plasmon resonance spectral band the electron temperature increases sharply, leading to a decrease in the intensity of the plasmon resonance and to its broadening. At the pump-probe experiment, just after excitation it looks like that bleaching occurs at the maximum of the SPRA band and induced absorption takes place at the wings. Then the electron temperature falls down due to electron-phonon interaction. This process proceeds for about few picoseconds. After that, the excess of energy in the NP is transferred to the surrounding (tens and hundreds of picoseconds). The goal of our experiments was to study the detail of relaxation processes depending on the gold nanoparticle-based complexes type. The citrate, proteins, glutathione, pentapeptided and others ligands were used for preparation of studied gold nanoparticle-based conjugates [3]. In order to study the spectral-kinetic characteristics of the nonlinear optical response we used the original femtosecond spectrometer [4]. The second harmonic of a Ti: sapphire laser (central wavelength of 400 nm, duration of 150 fs) was used for the samples excitation. Probing was carried out by femtosecond supercontinuum. The obtained results show that energy transfer characteristic times vary considerably for studied samples (from 100 ps for the gold NPs - citrate systems to 160 ps for gold NPs - protein (bovine serum albumin). The observed features are analyzed taking into account the type of ligands and character of the bonds forming the complex. The possibilities of the plasmon NP cooling control by means of ligand-shell changing may be important both for the development of new express spectroscopic techniques at biomedical analysis and the optimization of the laser photothermal therapy regimes.

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PI - 39

PHOTOLUMINESCENCE OF SILICON NANOPARTICLES PREPARED BY PULSED LASER ABLATION

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Abstract.

In this work, photoluminescence (PL) properties of silicon nanoparticles prepared by pulsed laser ablation method has been investigated. When excited by a laser beam, only a strong emission band centered at 635 nm was observed. Under continuous irradiation with UV (325 nm) laser beam in air or in oxygen gas atmosphere, the PL intensity decreases gradually. However, when the sample is irradiated with the same UV beam in vacuum, not only the intensity of the orange emission band increased, but a new strong blue band appeared. The dependence of PL intensity and spectral shape on the UV irradiation fluence was carried out in different conditions, in order to clarify the observed phenomena. In our opinion, the origin of these phenomena is probably associated with the energy transfer to the oxygen molecules adsorbed on the of porous silicon surface for the orange band and with the photo-oxidation process for blue emission band.

Keywords: porous silicon, PL enhancement, PL quenching, oxygen singlet, energy transfer.

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SYNTHESIS AND CHARACTERIZATION OF THE ORGANIC-INORGANIC HYBRID MATERIALS FOR FABRICATION OF PHOTONIC CRYSTAL

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Abstract.

This paper presents some results of our research on the organic-inorganic hybrid material. The hybrid material based on Methacrylicacid, Silica, Zirconia or Titania were synthesized by solgel process. The thin films have been prepared by dip-coating technique. The refractive index of hybrid material were controlled by changing relevant ratio of Silica and Zirconia or Silica and Titania. The refractive index and optical propagation loss of thin films were measured by the Prism Coupler Metricon 2010. The obtained results show that the organic-inorganic hybrid material is promising for applications in photonic crystal.

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PI - 41

SYNTHESIS AND LUMINESCENCE PROPERTIES OF Tb^{3+} IONS CONTAINED NANORODS BY A SOFT TEMPLATE - ASSISTE HYDROTHERMAL ROUTE

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Abstract.

Nanoluminophores containing Terbium ions (Tb^{3+}) with one dimension structures are increasingly applied as photonic detection tools in biomedicine. This report, we present the results of synthesis and luminescence characterization of nanorods of Terbium hydroxide and Terbium phosphate synthesized by a soft template-assisted hydrothermal route. We use a polyol polymer, which is good solution in water, soft template agents likes DiEthylenGlycol (DEG) or PolyEthylenGlycol 4000 (PEG 4000) to controlling in forming nanorods of $Tb(OH)_3$, and $TbPO_4$ for application in biomedical fluorescent label. The size of the rods can be controlled precisely and have diameters from 20 to 40 nm, lengths from 300 to 800 nm. Crystalline structure, morphology, and luminescence spectrum of Tb^{3+} ions contained nanorods were investigated by: X-ray diffraction (XRD), FTIR spectra, Field Emission Micrcroscopy (FESEM), and Luminescence spectroscopy. The photoluminescence (PL) spectrum of $Tb(OH)_3$ and $TbPO_4$ sample were measured at room temperatures under ultraviolet excitation and showed four high luminescence main peaks at 490, 545, 585 and 620nm.

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DYNAMICAL INTERACTION OF WHISPERING GALLARY MODE EVANESCENCE WAVE AND SILICA HALF TAPER FIBER TIP

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Abstract.

We discuss our analysis of the movement of a silica half taper fiber tip in the zone of whispering gallery mode evanescence waves from a microsphere. The spatial movement of the fiber tip is projected onto two planes, in other words, one projected movement is in the sphere's tangential plane and the other one is in the transversal planes. The first one turns out an oscillation under the dipole-dipole and elastics forces. This oscillation makes the fiber tip swing back and forth therefore make it able to collect the evanescence waves of different wavelengths. The latter are the ones which can bring the fiber tip down as described elsewhere and also observed in our experiment. These spatial forces may be attributed as the ones which make the observed whispering gallery mode selection happened.

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AEROSOL DISTRIBUTION OF ASEAN AREA BASE ON LIDAR MONITORING DATA AT HANOI AND TRAJECTORY STATISTICS SIMULATION

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Abstract.

Trajectory statistics method was used to reveal the aerosol source Asean regions. LIDAR Monitoring data of IOP LIDAR was used to build up aerosol distribution. The serult show the complexity of the geographic asean areas. It may cause variable of climate in local area.

PI - 44

NONLINEAR OPTICAL EFFECT IN KGW CRYSTAL AT CONTINUOUS-WAVE EXCITATION DUE TO RESIDUAL RARE-EARTH IONS

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Abstract.

Diode pumped solid-state laser systems are in the center of attention for many research groups. Continuous and quasi-continuous wave Raman lasers occupy a special place in this investigations, because they can be used in many applications as new sources of radiation in IR and visible spectral ranges [1,2]. As soon as Raman gain is relatively low, the careful consideration for sources of losses in the cavity of Raman lasers has to be made to support efficient operation of Raman lasers. As a rule, only passive losses due to reflection, absorption and scattering are taken in to account at development of Raman lasers. But it should be noted, that the active losses due to nonlinear optical effects have to be also included in consideration.

The nonlinear processes arising at action of continuous-wave laser radiation in potassium gadolinium tungstate (KGW) crystal were studied in our investigation. This crystal is often used in laser and nonlinear optical systems [3]. Its optical properties are subject of attention in many publications. As it was shown in our prior work [4], the green luminescence was observed in undoped KGW crystal, when it was irradiated by focused continuous-wave radiation of diode laser at 808 nm up to kW/cm^2 level of power density. It was connected with presence of Er ions.

In this report we present results on measurements of the residual Er ions concentration and characterize non linear process depending on laser power, such as up-conversion on the low concentrated Er^{3+} ions in KGW crystals. This effect can create additional active losses before Raman generation, so it is vital to Raman laser developing.

We tested crystals produced by the three manufacturers. Green emission was observed in each of the crystals. The difference was in the emission intensity. The values of ion concentrations were obtained by relation measurements of integral intensity in 540 – 560 nm band of green luminescence for undoped crystals and doped crystal with 1% concentration of Er ions, excited by Ar-ion laser radiation at 488 nm, respective the $^4I_{15/2} \rightarrow {}^4F_{7/2}$ transition (Table).

Table. Concentration *C* of the Er ions in KGW crystals

Crystal	**Orientation**	***C*, %**
Er:KGW	a+b, ⊥ a	1
KGW3	a+b, ⊥ a	$1*10^{-4}$
KGW1	a+b, ⊥ a	$8*10^{-6}$
KGW1	a+b, ‖ a	$8*10^{-6}$
KGW2	a+b, ‖ a	$1*10^{-6}$

These estimations are in qualitative agreement with the information from the manufacturer about concentration of Er ions in Gd_2O_3, used for manufacturing the samples of KGW and measured by mass-spectrometry method with the spectrometer JMS-01-BM2 (JEOL, Japan). It was found, that the possible concentration of Er ions impurities is less than $5x10^{-5}$ wt%.

Multiphoton absorption is usually responsible for the up-conversion effects. The number of participating photons can be estimated from dependence of emission intensity on pump power, which is given by the general expression $I \approx P^n$, where n is the number of pump photons [5]. Measured dependence of the green and red emissions intensity on the power for one of examples is shown in (Figure 1).

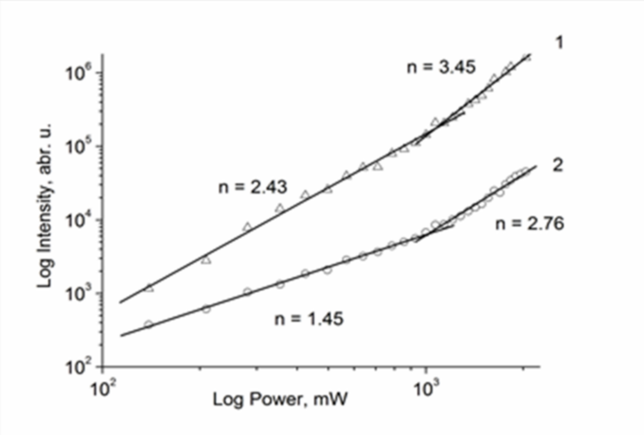

Fig. 1. *Log-log dependence of the green (1) and red (2) emissions intensity on diode power. Symbols are experimental data for the 970 nm pumping.*

Changes in a slope (n) of up-conversion luminescence intensity dependence on pump power at its increasing show modification of energy transfer process with participation of different number of photons. Two photon process for green and red emission is realized at 808 nm excitation and two and three photon process – at 970 nm pumping (Figure 1).

Excited state absorption is considered as the main effect responsible for up-conversion at low concentrations. To clarify the schemes of excitation calculations of branching ratios and life times for excited levels of Er ions in KGW and probability of nonradiative transitions between levels were estimated. Possible schemes of up-conversion processes at excitation by diode laser radiation at the 808 and 970 nm wavelengths were discussed.

Analysis of excitation spectrum and the dependences of intensities ration of green to red luminescence as well as absence of luminescence in the UV and blue spectral range registered in experiment indicate the significant participation of phonon relaxation processes and energy exchange between Er ions and KGW crystal matrix in our conditions.

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DEVELOPMENT OF A FLUORESCENCE MICROSCOPE USING TOTAL INTERNAL REFLECTION EFFECT (TIRFM)

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Abstract.

In recent years, novel techniques and applications of total internal reflection fluorescence microscopy (TIRFM) have been developed. Key technical achievements include miniaturization, enhanced depth resolution, reduction of detection volumes and the combination of TIRFM with other microscopic techniques. In biophysics domain, the applications have concentrated on single-molecule analysis. The most important advantage of TIRFM gives the highest contrast to the detected fluorescent image. This excitation configuration is wide used in Fluorescence Enhancement by Surface Plasmon Effect (SPE) which is one of the advances in single molecule microscope. This study provides a complete TIRFM experiment working on 200nm polystyrene spheres. The nanospheres were well observed only on the surface of the slide-glasses. The objects flowing out of the evanescence field did not present in the fluorescence images.

Keywords: Microscope, fluorescence microscope, total internal reflection microscope

PI - 46

A MONTE CARLO APPROACH TO EVELUATION OF EFFECTIVE EMISSIVITY OF A CYLINDER-INNER-CONE CAVITY

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Abstract.

Effective emissivity calculation of a cavity is among the first steps in designing of black body simulator. Based on absorption of reflected radiation model that assumes that the incident radiation reflected at the wall of the cavity by both specular and diffusse mechanisms, the authors proposed a simple algorithm using Monte Carlo approach to evaluate the effective emissivity of a cylinder-inner-cone cavity configuration. Such algorithm allows one to define the first order geometrical dimessions of the cavity that satisfy the most important system requirements. The results obtained by computer simulation are used in a black body simulator design and fabrication carried out at SCEI (Nacentech).

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REASEARCH IN APPLICATION OF LOW POWER SEMICONDUCTOR LASER IN TREATMENT TO REHABILITATE VARICOSE VEINS IN LEGS

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Abstract.

Introduction:

The shallow varicose veins in legs is the most commonly diseases in many countries on the world, specially disease rate is 35% in workers and 50% in retirees. The currently varicose veins treatmentuses the main methods:

- The internal medicine treatment use medicine through symptoms, this treatment has un-significant effect on varicose veins in legs.
- The method use bandage or medical stockings which rehabilitate pressure difference between the two shallow venous system through the inter-venous system and decreasing the diameter of vessel. However, patients do not bring medical stockings all day.
- Treatment by operating
- Treatment by high power laser
- The two methods of treatment by operating and high power laser have significant effect. However, this treatment loses a venous segment.

Therefore, we research for the varicose veins treatment by rehabilitating a varicose venous segment through wound healing, complication and maintain the venous function. This treatment uses the biological response which is caused by the effects of biological stimulation when the laser beam irradiate on tissue.

Method:

Using the effect of the two simultaneous wavelengths is created from the two types of semiconductor laser in treatment as the entity symptom and wound that recognized by ultra-sound.Using intravascular semiconductor laser to increase the endurance of veins, ruin thrombosis internal veins, rehabilitate one dimensional valve of veins in legs. Activating immune systems.

Results:

The forty patients are varicose veins divided 3 levels. Level 1 has 2 patients approximately 5%, level 2 has 27 patients approximately 67.5%, level 3 has 11 patients approximately 27.5%. This patients are treated by the equipment of intravascular and the equipment of opto-acupuncture

and opto-therapy by 12 channels semiconductor laser. After the two period of treatment achieves results: Level 0 has 17 patients approximately 42.5%**;** Level 1 has 20 patients approximately 50.0%**;** Level 2 has 3 patients approximately 7.5.%

Conclusion:

The method of rehabilitating motor function treatment of a varicose venous segment in legs use low level semiconductor laser that is new method. This treatment has many advantages such as the beneficial effect of rehabilitating treatment, conserve physiological function of natural veins, the process of treatment happens accident and side-effect, the manner of treatment is easy and simple.

PI - 48

EFFECT OF HYDROGENE PLASMA TREATMENT ON EFFECTCIENCY OF SILICON HETEROJUNCTION SOLAR CELLS WITH ZnO:Al TRANSPARENT CONDUCTIVE OXIDE

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Abstract.

The transparent conductive ZnO:Al thin film deposition by magnetron sputtering was used for an optical windows of amorphous silicon hetero-junction solar cell – c-Si/a-Si:H structure. However, these ZnO:Al thin films have the poor electrical properties due to this deposition processing also caused a very high concentration of defects in the interface of ZnO:Al and the rest of solar cell. This inconvenient conducts few negative impacts to the properties of solar cells (the low V_{OC}, low FF also as S- curve in I-V characteristic…). For overcoming this problem, the hydrogen plasma treatment procedure was used to enhance the conductivity of ZnO:Al. In this report, the bare solar cells were placed in hydrogen plasma at substrate temperature 200^{0}C, working pressure 1,5torr and RF power 300mW/cm^2 in 15, 30, 45, 60 min. The results show that the open circuit voltage, short current increase from 0,39V to 0,44 V and from 10mA/cm^2 to 18,1 mA/cm^2 respectively and the efficiency increase more than 2,5 times in the same devices. From these results, we believe that the hydrogen plasma treatment not only enhance the conductivity of ZnO:Al and also eliminate the interface defects between ZnO:Al layer with the rest of solar cell.

Keyword: hetero-junction, c-Si, TCO Transparent conductive oxides, hydrogen plasma treatment.

PI - 49

DETECTION AND LOCALIZATION TENDONS OF HUMAN HAND USING NEAR INFRARED IMAGING

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Abstract.

The human hand in anatomical terms is a complex structure including bones and tendons, joints and muscles, soft tissues and network of blood vessels, in which tendon injuries are the second most common injuries of the hand. Therefore need of rapid visual diagnosis of mentioned tendon system is very great. In this paper, the tendon system imaging of human hand was studied using near infrared imaging technique, which have many advantages such as noninvasive, non-ionizing, rapid and inexpensive method [1]. For this purpose, we have used light source with the wavelengths in the range of 700 to 1000 nm which have low absorption window and optimal contrast of image. Finally the image contrast could be enhanced by using crossed polarizers, neutral density filters to remove the glare from the skin surface and selected procedures of image processing.

Keywords: *non-invasive diagnostic methods, human hand, tendons.*

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PI - 50

DESIGN AND MANUFACTURE A PROGRAMABLE MECHANICAL SYSTEM SCANNING TWO TWO DIMENSIONS AND APPLIED REMOTE SENSING

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Abstract.

A mechanical system able to scan two directions connected to computer will be very meaningful for remote sensing purpose especially for those which require observation in spatial distribution and variation to physics properties under the volume 3D. Therefore, the design and manufacture a mechanical system of scanning two-dimention with precision to ~1/100^{o}/step is a difficult requirement and applicability in the future. The two-dimention mechanical scanning system controlled and connected computer to allow programming changes the resolution of the measurement space and time for the first time has been made at the Institute Physics - Academy of Science and Technology of Vietnam. We apply the scanning 2-D for ranging finder using diode lidar firstly mapping the terrain image in Hanoi Vietnam.

PI - 51

CHEMICAL TRANSFORMATION FABRICATION FROM ONE DIMENTIONAL NANOMATERIALS $Y(OH)_3:Er^{3+}$, Yb^{3+} TO $NaYF_4:Er^{3+}$, Yb^{3+} AND THEIR UPCONVERSION LUMINESCENCE PROPERTIES

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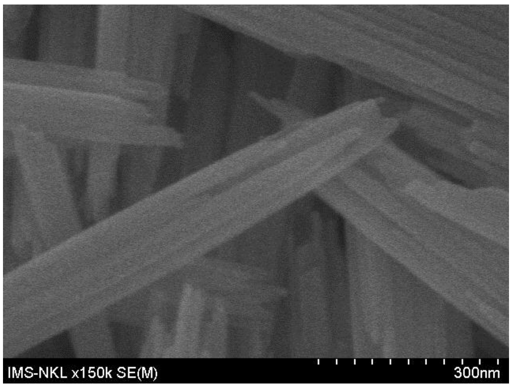
Abstract.
In this paper we present chemical transformation synthesis and upconversion luminescence properties of the nanomaterials with one dimentional structures from $Y(OH)_3$: Er^{3+}, Yb^{3+} to $NaYF_4$: Er^{3+}, Yb^{3+} nanorods and types. The single-crystalline of $NaYF_4$: Er^{3+}, Yb^{3+} one dimentional nanomaterilas have been successfully synthesized in using $Y(OH)_3$ nanotubes and nanorods as precursors. The transformation process from $Y(OH)_3$ precursor to $NaYF_4$ one-dimensional nanomaterials was investigated by time-dependent experiments. The crystal structure, morphology, and luminescence properties were characterized by XRD, FE-SEM, and PL, respectively. The results show that the $NaYF_4$: Er^{3+}, Yb^{3+} nanorods and nanotypes have high purity, high crystallinity and high luminescence intensity. Under NIR laser excitation at 976 nm, the $Y(OH)_3$: Er^{3+}, Yb^{3+} and $NaYF_4$: Er^{3+}, Yb^{3+} nano one-dimensionals exhibit strong green and red emission regions assigned to ($^2H_{11/2}$, $^4S_{3/2}$) $\rightarrow$ $^4I_{15/2}$ and $^4F_{9/2} \rightarrow$ $^4I_{15/2}$ transitions of the Er^{3+} ions, respectively.



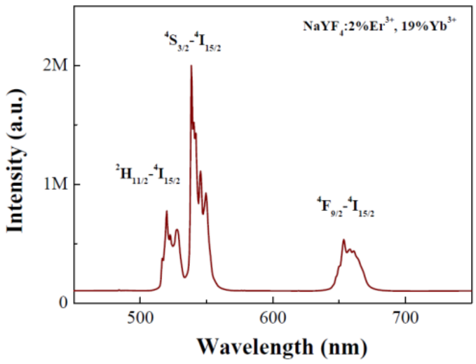


Figure 1. *The FESEM images of precursor of $Y(OH)_3$: Er^{3+}, Yb^{3+} nanorods and the upconversion luminescence spectra of the $NaYF_4$: Er^{3+}, Yb^{3+} nanorods under NIR laser excitation at 976nm.*

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PI - 52

PREPARATION OF FLUORESCENT POLYMER MICROSPHERES

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Abstract.

Mono-dispersed polymer microspheres with size of 1-2 µm were synthesized by free-surfactant emulsion polymerization in mixture of alcohol and water with methylmethacrylate and styrene as monomer and ammonium persulfate as initiator. Scanning electron microscopy and dynamic light scattering showed that the microspheres were very uniform. Furthermore, the polymer microspheres were stained using swelling agents and rhodamine B as fluorescent dye. These high fluorescence intensity and uniform distribution of fluorescent polymethylmethacrylate beads have various applications, specially in fluorescent single molecule microscope calibration.

PI - 53

SINGLE-PULSE SUPERCONTINUUM GENERATION IN PHOTONIC CRYSTAL FIBERS

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Abstract.

Photonic crystal fibers (PCF) have a huge flexibility on choosing the dispersive properties which can favor the nonlinear effects. The injection of femtosecond laser into PCF produces a broadening of the spectra, also called Supercontinuum (SC), due to the nonlinear responses of microstructured silica. In this work, the SC generation in the fiber has been experimentally observed and the dynamic of the SC development during the propagation has been calculated. The condition to obtain the single-pulse SC with maximum broadening of spectra in the short wavelength has been found. We show how to control the regime of soliton propagation which maintains the Kerr effect and the interaction with the dispersive waves.

PI - 54

MICROWAVE-ASSISTED SYNTHESIS OF VISIBLE-LIGHT-INDUCED Bi_2WO_6 PHOTOCATALYSTS

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Abstract.

Bi_2WO_6 nanopowders photocatalysts were successfully synthesized via microwave-assisted method. Thermal analysis (TGA) and differential scanning calorimetry (DSC) have been used to study the thermal behavior of the as-prepared sample. The characteristics of the products were investigated by X-ray diffraction (XRD), scanning electron microscopy (SEM), high resolution transmission electron microscopy (HRTEM), Raman spectroscopy, and UV-vis diffuse reflectance spectroscopy. The photocatalytic activities of the products were evaluated by photodegradation of methylene blue (MB) under visible light irradiation. It has been found that microwave radiation time and thermal treatment conditions during the synthesis processes were an important parameter controlling the phase formation and morphology of the Bi_2WO_6 nanopowders. The results show that Bi_2WO_6 nanopowders synthesized under microwave radiation of 20 mins and annealed at 500 ^{0}C exhibits an optimal photocatalytic performance with the MB degradation rate of 80% at 6 hr under visible light irradiation.

Keywords: Microwave asissted, Bi_2WO_6 nanopowders, Photocatalysis.

PI - 55

TREATMENT OF INFLAMATION AND RHEUMATHISM BY USING LASER DIODE THERAPY EQUIPMENT

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Abstract.

High power laser diode therapy equipment designed and preparedby Institute of Materials Science, VAST, was used in the period of about one year to treat inflamation and rheumathismfor 100 patients at theMilitary Central Hospital 108. The high optical power (up to 500 mW) red laser beam with wavelenght of 670 nm and irradiation dose of 4 - 8 J/cm^2 was used for inflamation and infected wound treatment and 940 nm infrared laser beam (up to 1000 mW) with the irradiation dose of 10 – 12 J/cm^2 was used for rheumatic, osteoarthritic treatments. Data of the laser treatment went through statistical analysisusing the Statistica software package Epi Info 6.0.The redlaser beam treatment results showed that the healing of different types of inflamation, infected woundwas succesful for almost of all 73 treated patients. The infrared laser beam treatment for rheumatic patients showed good effect for 81% of 27 treated patients. No side-effects were observed during laser treatment.

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PI - 56

USING LASER DIODE THERAPY EQUIPMENT TO TREAT BURNS AND WOUNDSOF RABBITS

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Abstract.

High power laser diode therapy equipment designed and preparedby Institute of Materials Science, VAST, was used in the period of eight months to treat burns and wounds of 40 rabbits at the National Le Huu Trac Burn Institute. The optical output power of the 670 nm red laser heads is up to 500 mW. Data of the laser treatment went through statistical analysis using the Statistica software package Epi Info 6.0. The treatment results showed that the radiation dose about 4 J/cm^2 of red laser beam combinated with Silvirin (SSD 1%) as typical medicine for burn treatment did not have the heal improvement in comparison with the case of using only SSD 1%. Meanwhile, the wounds created by knife and especially by chemicals such as Adriamycin on rabbits showed good improvement of healing when the above laser beam was used toghether with SSD 1%: the shrinkage of the wound area increased and the speed of wound healing was improved considerably. No side-effects were observed during laser treatment.

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PI – 57

PHOTOLUMINESCENCE LIFETIMES IN NIR – AN AFFORDABLE QUANTAMASTER OPTION

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Abstract

Applications involving photoluminescence (PL) measurements in NIR have been rapidly growing in recent years. The demand comes mainly from several areas in materials science, such as fiber optics telecommunication, solar energy conversion, lasing media, LED and OLED technologies and development of upconversion nanoparticles for biomedical analyses and bioimaging. Most of these applications involve rare earth ions (lanthanides), many of which emit in NIR. Often these ions are used with ligand photosensitizers which improve their light absorption properties, they are used as dopants in lasing media and glasses and are made into nanoparticles of varying size and shape in order to control their optical properties. The PL lifetime is the key parameter in assessing the optical efficiency of such devices as well as in quality control during their manufacturing.

The PL lifetimes of lanthanides fall into the microsecond to millisecond time range. PTI QuantaMaster Series includes specially optimized solid-state detectors, such as TE-cooled InGaAs, PbS and others, as well as pulsed light sources (xenon pulsed lamp, PTI tunable nitrogen/dye laser and 3rd party Q-switched lasers, such as tunable Opolette laser) to provide a very efficient system for PL decay measurements in NIR. The NIR lifetime option utilizes PTI proprietary Single-Shot Transient Digitizer (SSTD) technique, which affords extremely rapid signal accumulation and highly accurate lifetime determination with included lifetime analysis software package. In line with PTI philosophy, the NIR lifetime option is fully modular and can be used either in a stand-alone instrument or combined with any QuantaMaster or TimeMaster system as an upgrade. With existing systems, the NIR lifetime detector can be added to the 2nd exit port of the emission monochromator and a NIR-optimized grating will be also added together with the dual grating turret to the monochromator. Alternatively, a new emission monochromator with the NIR grating and NIR lifetime detector can be added to the instrument converting it into a T-format system. A Xe pulsed lamp can be added to the 2nd entrance port of the excitation monochromator or a pulsed laser can be attached via fiber optics to the unused side of the sample compartment. It should be noted that the NIR lifetime detector would also work in the steady-state mode with a cw light source and appropriate detection electronics.

PI – 58

UPCONVERSION PROPERTIES OF Yb^{3+}:Er^{3+} DOPED $Al_2O_3SiO_2$ GLASSES PREPARED BY SOL-GEL METHOD

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Abstract.

Yb^{3+}: Er^{3+} doped aluminum silicate glasses had been synthesized using the sol-gel method. The green ($^4S_{3/2}$, $^2H_{11/2} \rightarrow {}^4I_{15/2}$) and red ($^4F_{9/2} \rightarrow {}^4I_{15/2}$) upconversion (UC) emissions as two-photon excitation process were found by 980 nm infrared diode laser excitation. X-ray diffraction (XRD), scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR) and photoluminescence have been investigated.

PII-01

EFFECT OF HIGH ENERGY ELECTRON BEAM IRRADIATION ON THE OPTICAL PROPERTIES OF ZnO QUANTUM DOTS (QDS)

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Abstract.

The effect of high energy electron beam irradiation on the optical properties of ZnO quantum dots (QDs)was studied in order to modify the optical absorption performance and photo-activity. Electron beam irradiation may have resulted in size reduction, which in turn caused an increase of the optical band gap and photoluminescence intensity. Irradiation at a suitable dose rate was found to enhance the optical absorption performance and photo - activity of the tested ZnO quantum dots (QDs).Our results are expected to have significant technological implications.

PII-02

FABRICATION AND CHARACTERIZATION OF ZINC - DOPED P SnO_2 THIN FILMS

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Abstact.

P- typed transparent SnO_2: Zn (ZTO) thin films were successfully fabricated on quartz substarates by DC magnetron sputtering using a 15 wt% ZnO doped with 85 wt% SnO_2 ceramic target followed by deposited at various temperature. The effect of temperature on the structural, electrical and optical performaces of SnO_2:Zn has been studied. The prepared films were characterized by X-ray diffraction, Hall effect measurement, and UV- visible. ZTO Films were deposited in Argon (Ar) ambient gas at working pressure of 3 mtorr, various temperatures from 60 to 500^{o}C range. Deposited films showed p type electrical property, polycrystalline tetragonal rutile structure and their average transmittance above 80% in visible light range at the temperature of 300^{o}C in the other. The best electrical properties of film were with its resistivity, hole concentration and Hall mobility are 1.638 Ω.cm, $6.41.10^{17}$ cm^{-3} and 6.223cm^{2}V^{-1}s^{-1}, respectively.

PII-03

STUDYING AND FABRICATING P - TYPE TRANSPARENT CONDUCTING Ga DOPED SnO_2 THIN FILMS BY DC MAGNETRON SPUTTERING

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Abstract.

Ga doped tin oxide films (GTO) were prepared on Quart glasses by direct current (DC) magnetron sputtering using (SnO_2 + 15%wt Ga_2O_3) mixture ceramic target. X ray diffraction (XRD), Hall - effect measurements and UV-vis spectra were performed to characterize the deposited films. The substrate temperature of films was investigated for two steps. At first, GTO Films were deposited in Argon (Ar) ambient gas at working pressure of 4 mtorr, various temperatures from 60 to 400 ^oC range. After that, they were deposited at 400 ^oC temperature, and then annealed in Ar ambient gas up to higher temperatures. It is found that, GTO films were n type electrical property and nonconductive at 400 ^oC substrate temperature in the first step. Deposited films showed p type electrical property, polycrystalline tetragonal rutile structure and their average transmittance above 80% in visible light range at the optimum annealing temperature of 550 ^oC in the other. The best electrical properties of film were with its resistivity, hole concentration and Hall mobility are 0.54 Ω.cm, $3.3.10^{18} cm^{-3}$ and 3.54 $cm^2V^{-1}s^{-1}$, respectively.

PII-04

IMPROVING THE AMMONIA SENSING OF REDUCED GRAPHENE OXIDE FILM BY USING NANOMETER METAL MATERIALS

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Abstract.

Gas sensing is one of the most promising applications for reduced Graphene Oxide (rGO). High surface-to-volume ratio in conjunction with remaining reactive oxygen functional groups translates into sensitivity to molecular on the rGO surface. The response of the rGO based devices can be further improved by functionalizing its surface with nanometer metal materials. In this paper, we report the ammonia (NH_3) sensing behavior of rGO based sensors functionalized with three metals: silver (Ag), platinum (Pt), and gold (Au) in air at room temperature and atmospheric pressure. The gas species are detected by monitoring changes in electrical resistance of the rGO/metal hybrids due to gas adsorption. Compared to bare rGO, significantly improved NH_3 sensitivity is observed with the addition of nanometer metals. The nanometer metals are applied to play the small bridges role connecting many graphene islands together to improve electrical properties of hybrids while maintaining the inherent advantage of rGO for NH_3 gas sensitivity.

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PII-05

DETERMINATION OF THE CONCENTRATION OF FLUORESCENT POLYMERS USING THE LASER – μTAS

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Abstract.

Microfluidic analysis systems, also known as Micro total analysis systems (μTAS) or "Lab-on a-Chip" are a rapidly developing field. There are many kinds of μTAS due to the purpose of the experiment we needed. In this report, we use the Laser - micro total analysis system (Laser-μTAS) to determine the concentration of the fluorescent polymer such as AlQ_3 conducting polymer and R6G fluorescent polymer. The modulation signal with frequency 5Hz was applied to μTAS system for modulating the excitation light and referencing to Lock-in Amplifier. This way resulted in the limit of detection (LOD) of the Laser – μTAS for AlQ_3 down to 10 nM and R6G down to 1 nM based on the calculation of the received "Lock-in amplifier SR510" data.

Keywords: *μTAS, Microfluidic chip.*

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PII-06

CHARACTERISTIC OF ZnO NANOTUBES FABRICATED BY CHEMICAL CORROSION METHOD FROM ZnO NANORODS AND THEIR PHOTOCATALYST ACTIVITY

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Abstract.

ZnO nanotubes were successfully fabricated from ZnO nanorods by chemical corrosion method in KCl solution. The characteristics of ZnO nanotubes such as crystal structure, shape, photocatalytic activity, decomposition of methylene blue solution under ultraviolet irradiation, and the luminescence of terephthalic acid solution after photocatalyst process were investigated by XRD, SEM, TEM, $^{\bullet}OH$ rate analysis. The results showed that in the condition of 3 hour-corrosion, 85 ^{o}C, the concentration of KCl corrosion solution C_M = 2 mol/l, ZnO nanotubes have wurtzite structure, uniform density, c-axis oriented growth. Biodegradation solution of methylene blue and fluorescence intensity of terephthalic acid after photochemical reaction of tube structure are higher than rod counterpart, so the photocatalytic activity of ZnO nanotubes is better than ZnO nanorods.

PII-07

STRUCTURAL AND MAGNETIC PROPERTIES OF (1- x) $BaTiO_3$ – $xCoFe_2O_4$ MULTIFERROIC COMPOSITES BY SOLID-STATE REACTION METHODS

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Abstract.

Two groups of (1-x)$BaTiO_3$ –x$CoFe_2O_4$ multiferroic composites containing barium titanate ($BaTiO_3$) and cobalt ferrite ($CoFe_2O_4$) were synthesized by a simplified one pot solid-state reaction process, in which all of the basic chemicals (BaO, TiO_2, Fe_2O_3, Co_2O_3) were directly mixed together. Composite materials have ferroelectric phase ($BaTiO_3$) and ferromagnetic phase ($CoFe_2O_4$). Structural was investigated by Raman scattering measurement, X-ray diffraction technique (XRD), Fourier transform infrared spectroscopy (FT-IR). According to crystallography, there are eight Raman active modes for tetragonal $BaTiO_3$ ($4E_1+3A_1+1B_1$) and five Raman active modes for cubic inverse spinel $CoFe_2O_4$ ($A_{1g}+1E_{g1}+3T_{2g}$). FT-IR spectra in the region of 600 - 380 cm^{-1}, represents the characteristic infrared absorptions of the metal-O vibrations in composite. The peak at 414 cm^{-1} can be attributed to normal TiO_{II} bending vibrations; peak 565 cm^{-1} is due to TiO_6 stretching vibration connected to the barium and Fe-O stretching mode for 480 cm^{-1} indicates the formation of ferrite. Magnetization measurements were obtained at room temperature by using a vibrating sample magnetometer (VSM), which showed saturation magnetization and remanence of the composites (1- x)$BaTiO_3$ –x$CoFe_2O_4$ linearly increased with the molar fraction of $CoFe_2O_4$ content while the coercivity decreased accordance with the Bruggeman model.

PII-08

THE MODELLING OF G|M|LIGAND NANOSTRUCTURES: A DENSITY FUNCTIONAL THEORY INVESTIGATION

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Abstract.

We give a model of nanomaterials have two-dimensional structures using first principle in which complex metal-Naphthalelen (M-Nap) and Gaphene (G) are connected together through coordination location, with 2 metal we investigate the Cr and Fe. The metal organic complexes of $Fe(C_{10}H_8)$ and $Fe_2(C_{10}H_8)$ was found to be linked to create a stable surface Gaphene with 2 different configurations, whereas complexes $Cr(C_{10}H_8)$ and $Cr_2(C_{10}H_8$) stable only in a single configuration. In total, six configurations denoted by $GCr(C_{10}H_8)$, $GCr_2(C_{10}H_8)$, $GFe^1(C_{10}H_8)$, $GFe^2(C_{10}H_8)$, $GFe^1{}_2(C_{10}H_8)$, $GFe^2{}_2(C_{10}H_8)$ is our investigation, in which the similarity density distribution but different geometric structures of the complexes (M-Nap) Gaphene surface. The calculation of binding energy between Gaphene and complex showed good stability of their structure, which $GFe^2(C_{10}H_8)$ is the most unstable and $GCr_2(C_{10}H_8)$ is the most stable with binding energy is 3.02 and 1.3 eV, respectively. Analysis of the partial density of states (PDOS) shows structural components $GCr_2(C_{10}H_8)$ the most stable due to the overlap of orbitals clear $3d_{z^2}$, $3d_{zx}$, $3d_{zy}$ (Cr) and $2p_z$(C). The spin-polarized calculations show that there is a significant change from the moment of the structure, a structure Interestingly $GCr_2(C_{10}H_8)$ show strong ferromagnetism with magnetic moment is found to be 2.47 μB/cell, which is mainly due to the contribution from the 3d shell of Cr. Addition, the $GFe^1{}_2(C_{10}H_8)$ and $GFe^2{}_2(C_{10}H_8)$ nanostructures are reported to have weak ferromagnetism than $GFe^1(C_{10}H_8)$ and $GFe^2(C_{10}H_8)$ structures.

Keywords: *graphene, DFT, graphene - metal organic interaction, magnetism, nanostructure*.

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PII-09

TiO_2 NANOPARTICLE THIN FILM DEPOSITION BY PULSED LASER METHOD

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Abstract.

The pulsed laser deposition (PLD) technique has been used for the deposition of nanostructured Titania (TiO_2) nanoparticles thin films. The TiO_2 nanoparticles, synthesised by a novel chemical route, was frozen at liquid nitrogen temperature and irradiated with a pulsed laser in a vacuum chamber. The surface structure, morphology, optical transmission characteristics, and chemical compositions of the films are analyzed by atomic force microscopy, scanning electron microscopy, UV-Vis spectroscopy, and X-ray diffraction. A uniform distribution of TiO_2 nanoparticles with an average size of about 10 nm was deposited on Si substrates demonstrated by SEM and AFM. A comparison with a spin coated thin film obtained from the same solution of TiO_2 nanoparticles is reported. These results are promising for the development of sensor devices.

Keywords: *PLD method, TiO_2, thin film.*

PII-10

STUDYING AND FABRICATING P - TYPE TRANSPARENT CONDUCTING ANTIMONY - DOPED SnO_2 THIN FILMS BY DC MAGNETRON SPUTTERING

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Abstract.

Sb doped tin oxide films (ATO) were fabricated on Quart glasses from (SnO_2 + Sb_2O_3) mixture ceramic target by direct current (DC) magnetron sputtering in Ar ambient gas at working pressure of 2.10^{-3} torr. X ray diffraction (XRD), Hall - effect measurements and UV-vis spectra were performed to characterize the deposited films. The substrate temperature of films was investigated for two ways. Films were annealed in Ar ambient gas after deposited at room temperature in one way. They were deposited directly with different temperatures in the other. It is found that, ATO films fabricated in the first way were easier than those fabricated in the other. Deposited films showed p type electrical property, polycrystalline tetragonal rutile structure and their average transmittance above 80% in visible light range at the optimum annealing temperature of 550^{o}C. The best electrical properties of film were obtained on 10%wt Sb_2O_3 doped SnO_2 target with its resistivity, hole concentration and Hall mobility are 0.37 Ω.cm, $2,58.10^{19}$ cm^{-3} and 0.54 $cm^2V^{-1}s^{-1}$, respectively.

PII-11

PHOTOCATALYTIC WATER SPLITTING BY USING TiO_2 PHOTOANODE

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Abstract.

Copper (Cu) was doped into TiO_2 in order to lower the bandgap of TiO_2 when Cu substitutes for Ti, as well as to obtain the incorporation of twosemiconductor materials with different conducting types. There, one has absorbance edge in visible range. Therefore, we fabricated$Ti_{1-x}Cu_xO_2$nano-powder by sol-gel method combined with heating treatment at 450 ^oC. This powder has the particle size of 10 nm and BET surface area about of 85 m^2/g. Photoelectrode with a structure of glass/FTO/$Ti_{1-x}Cu_xO_2$, here,x varies from 0 at% to 8 at%, was prepared by spin-coating method and annealed at 450 ^oC in air. Photocatalyst splitting hydrogen from water under standard sunlight was taken place in room temperature. Dark current and photocurrent were recorded when non-illuminating and illuminating the sunlight AM1.5. The results reveal that water splitting efficiency is not linear dependent on concentration of Cu. The highest efficiency was observed at the sample with 2 at% of Cu. This result can be explained by lowering the bottom of conducting band and the random of n/p (TiO_2/CuO) contacts which cause the decrease in conductivity of photoelectrode when Cu concentration increases. Based on these results, we made a discussion on photocatalytic ability of photoelectrode based on incorporation of two nano semiconductor materials.

Keywords: *Nanomaterials, TiO_2, photocatalytic effect, water splitting.*

PII-12

RELATION TO OXYGEN OF THE VIOLET-BLUE BAND IN THE PHOTOLUMINESCENCE SPECTRUM OF POROUS SiC THIN FILM LAYER FABRICATED BY ANODIC ETCHING IN DILUTE HF SOLUTION

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Abstract.

In this report we present some study results on the photoluminescence (PL) of porous SiC. A porous SiC layer has been created on SiC thin films by anodic etching (implemented in the constant current regime) in dilute aqueous solution of HF. We observed strong PL in the violet-blue region of the above porous SiC layer, with the PL intensity of hundreds of times stronger than that of the sample before etching. Furthermore, we have found that when the higher etching current density is used, the PL intensity of this band increases respectively. On the other hand, the results of energy dispersive X-ray (EDX) analysis showed that the anodic oxidation process occurs during SiC anodic etching and the higher current density, the stronger anodic oxidation. Combining these facts together, we can say that the results of our study show a clear relation to oxygen of the blue-violet band in the PL spectrum of porous SiC.

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PII-13

STUDIES, DESIGN LIDAR SYSTEM USING 40 cm TELESCOPE

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Abstract.

LIDAR technology have been developed in Vietnam. We plan to develop LIDAR system with a 40 cm telescope in order to measurement density at the higher atmosphere. The telescope 40 cm Meade LX200 is the biggest telescope in Vietnam for now, so we have to design optical system difference with the previous LIDAR systems in Vietnam. We have been calculated and simulated the model for the LIDAR system in order to have the best design, and this LIDAR system allow us measure atmosphere up to more than 10 km. Our calculation let us know that this LIDAR system could be measure up to 70 km of the High Altitude of the atmosphere.

PII-14

MICROWAVE-ASSISTED SYNTHESIS OF VISIBLE-LIGHT-INDUCED Bi_2WO_6 PHOTOCATALYSTS

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Abstract.

Bi_2WO_6 nanopowdersphotocatalysts were successfully synthesized via microwave-assisted method. Thermal analysis (TGA) and differential scanning calorimetry (DSC) have been used to study the thermal behavior of the as-prepared sample. The characteristics of the products were investigated by X-ray diffraction (XRD), scanning electron microscopy (SEM), high resolution transmission electron microscopy (HRTEM), Raman spectroscopy, and UV-vis diffuse reflectance spectroscopy. The photocatalytic activities of the product were evaluated by photodegradationof methylene blue (MB) under visible light irradiation. It has been found that microwave radiation time and thermal treatment conditions during the synthesis processes were an important parameter controlling the phase formation and morphology of the Bi_2WO_6 nanopowders. The results show that Bi_2WO_6 nanopowderssynthesized at microwave radiation of 20 mins and annealed at 500 ^{0}C exhibits an optimal photocatalytic performance with the MB degradation rate of 80% at 6 hr under visible light irradiation.

Keywords: *Microwave assisted, Bi_2WO_6nanopowders, Photocatalysis.*

PII-15

DESIGN OF AN OPTICAL TWEEZER FOR MANIPULATING MICROMETER-SIZED OBJECTS

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Abstract.

Optical tweezer has become an indispensable research tool to manipulate micrometer and sub-micrometer targets, to study physical properties of biological molecules such as DNA or proteins. At the Institute of physics we have initiated the development of an optical tweezer for research and training purposes. The optical tweezer uses high numerical aperture (NA=1.25) microscope objective, a 50 mW diode-pumped continuous green Nd:YAG laser for trapping. The detection and monitoring of the trapped objects is achieved using a high speed CMOS camera. Initial measurements of the main properties of our optical tweezer are also presented and discussed.

PII-16

STUDIES LUMINESCENCE OF ION Dy^{3}, Eu^{3+}, Mn^{2+} IN THE $BaO.Al_2O_3.B_2O_3$ GLASS

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Abstract.

Dy^{3+} ions doped and Dy/Eu or Dy/Mn co-doped glasses for light-emitting-diodes (LED) applications have been synthesized by melt quenching method. Their photoluminescence properties were studied by emission and excitation spectra. The $^4F_{9/2}$ - $^6H_{15/2}$, $^6H_{13/2}$ and $^6H_{11/2}$ emission of Dy^{3+} can be varied by adjusting Dy^{3+} concentrations and the compositions of glass matrix. Blue, Orange and Red- orange emission bands were observed in the emission spectra of Dy/Eu or Dy/Mn co-doped glasses. The combination of these emission bands allows the realization of white light when the glasses are excited by near ultraviolet light. In addition, the relative intensity ratios of respective emission lines are dependent on the composition of glasses and the excitation wavelength.

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PII-17

EFFECT OF Tb^{3+} CONCENTRATION ON LUMINESCENT PROPERTIES OF $Sr_3B_2O_6$ PHOSPHORS

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Abstract.

The $Sr_3B_2O_6$: Tb^{3+} phospors were prepared by combustion method combination heating at high-temperature. Results of the crystalline structure indicate that the $Sr_3B_2O_6$:Tb^{3+} phospors has a Rhombo single phase. The excitation spectra shows that this phosphor can be excited by ultraviolet light of near 379 nm. The emission spectra under 379 nm excited wavelength includes several narrow lines, which is $^5D_4$-^7F_j (j=2, 3, 4, 5, 6) transitions of Tb^{3+} ion. The emission intensity of Tb^{3+} in $Sr_3B_2O_6$ is influenced by the Tb^{3+} doping content and optimum concentration of Tb^{3+} is 3%mol. The concentration quenching of Tb^{3+} in this phosphor occurs when Tb^{3+} concentration is more 3 %mol.

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PII-18

LUMINESCENCE PROPERTIES AND ENERGY TRANFER OF Eu/Tb IONS CODOPED TELLURITE GLASSES

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Abstract.

The Eu^{3+}/Tb^{3+} codoped glasses with the composition of TeO_2 - B_2O_3 – ZnO – Na_2O – RE_2O_3 (RE =Eu, Tb) has been synthesized by melt quenching method and their luminescence properties were investigated by excitation and emission spectra. The photoluminescence spectrum of Eu^{3+} doped Tellurite glass has revealed a bright *red* emission at 612 nm ($^5D_0 \rightarrow {}^7F_2$) with an excitation at 394 nm ($^7F_0 \rightarrow {}^5L_6$). With Tb^{3+} ion singly doped glass has shown a prominent *green* emission at 543 nm ($^5D_4 \rightarrow {}^7F_5$) with an excited at λ_{exci}=379 nm ($^7F_6 \rightarrow {}^5G_6$). Tellurite glasses having Eu^{3+}(1 mol%) co-doped with Tb^{3+} (1mol%) at an excitation of λ_{exc}=379 nm, have exhibited an energy transfer from Tb^{3+} to Eu^{3+} ions hence causing an enhancement in red emission from Eu^{3+}. The mechanism involved in this energy transfer process from terbium to europium ions has been explained in terms of an energy level diagram.

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PII-19

DETERMINATION OF THERMAL EXPANSION OF POLYMERS BY USING LASER BEAM DIFFRACTION METHOD

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Abstract.

Laser beam diffraction by a patterned surface has been investigated theoretically and experimentally for the determination of the thermal expansion in some polymeric materials. By tracking the deviation of high-order diffraction modes from surface-patterned polymers, expansion coefficients in the $10^{-7}$to 10^{-4} $^{o}C^{-}1$ range can be measured over temperature changes of only 10 ^{o}C. A set-up of laser diffraction (SLD) was made, using a He-Ne laser (λ= 632.8 nm) and a specific sample preparation technique. Measurement results obtained on the SLD for some conducting polymers like PVK, polycarbonate, PDMS, chitosan showed that this optical technique can be applied to determine the thermal expansion coefficient of both the transparent and opaque materials with a high accuracy, using a considerably small sample volume.

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PII-20

SYNTHESIS GOLD NANOPARTICLES AND USING SPECTROSCOPY TO STUDY CONJUGATE OF GOLD NANOPARTICLES WITH ANTIBODY FOR QUARTZ CRYSTAL MICROBALANCE (QCM) BIOSENSOR

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Abstract.

The gold nanoparticles (GNPs) in 15-20 nm size range have attracted attracted attention for fabrication of smart sensing devices in biomedical sciences as diagnostic tools. Citrate capped GNPs are negatively charged, which can be exploited for electrostatic interactions with some positively charged biomolecules like antibody. In this study, we are developing a low-cost technique by using a common microwave system with medium power for synthesizing gold nanoparticles with using sodium citrate (Na_3Ct) reduction in chloroauric acid ($HAuCl_4.3H_2O$). After that GNPs were functionalized with 11-mercapto-1undecanol and 16-mercaptohexadecanoic acis. We show that GNPs conjugate with antibody by using optical spectroscopy (UV-VIS absorption spectroscopy (UV-Vis), FT-IR, Raman) and quantum chemical calculation vibration spectrum.

Keywords: *gold nanoparticles, IR, Raman spectral, biosensor.*

PII-21

FABRICATION OF TiO_2 NANOTUBE BY USING ELECTROCHEMICALLY DEPOSITED ZnO NANOROD TEMPLATE

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Abstract.

In this study, TiO_2 nanotubes have been fabrication by using the electrochemically deposited ZnO nanorod as a template in the spin-coating procedure of Ti precursor. The length and diameter of TiO_2 nanotubes can be controlled by changing the initial ZnO nanorod template. The optical, structural properties of TiO_2 nanotubes were characterized by the UV - Vis, PL, XRD and SEM, respectively. The successful fabrication and investigation of properties of TiO_2 nanotubes is a step forward to fabricate dye – sensitized solar cell (DSSC).

Keyword: *TiO_2 nanotubes, DSSC solar cells, ZnO nanorod, sol – gel method.*

PII-22

GROWTH FEW LAYERS MOLYBDENUM DISULFIDE (MOS_2) USING CVD PROCESS

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Abstract.

Molybdenum disulfide (MoS_2) thin film is the kind of material having the graphene-like structure with single and few-layer thickness which has electrical properties of semiconductor that make them as an potential candidate for low power electronic applications such as transistor, photonic devices…. Here we demonstrate the method to growth few layers MoS_2 on Si/SiO_2 substrate using CVD process. The samples are observed under Raman spectroscopy, X-ray diffraction, PL spectrum which can give more information to control structure, thickness, uniform of thin films in preparation process.

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PII-23

THE EFFECT OF TEMPERATURE TO MORPHOLOGY OF NANO STRUCTURE ZnO GROWN BY CVD METHOD

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Abstract.

ZnO nanostructure has been used for transparent conductors, solar cells, sensors… The properties of ZnO nanostructure are strongly dependent upon the method of preparation [1-3]. In this work, ZnO nanostructure with the c-axis orientation were deposited by CVD method (chemical vapor deposition). The crystalline phase and orientation of ZnO nanostucture were identified using X-ray diffraction (XRD). The morphology of ZnO nanostructure were observed using a scanning electron microscope (SEM). When ZnO nanostructure was deposited by LPCVD (low pressure chemical vapor deposition), it has different kinds of morphology, such as: ZnO nanoparticles, ZnO nanoleaves, nanorods, nanoflowers. The growth mechanism of ZnO nanostructure in LPCVD was VLS (vapor-liquid-solid). However, with APCVD (air pressure chemical vapor deposition), the morphology of ZnO nanostructure was nanowires, the average diameter and length of ZnO nanowires is about 20 nm and 3 μm and the growth mechanism of ZnO nanostructure in this method was VS (vapor-solid).

Keywords: *ZnO nanostructure, CVD method, APCVD, LPCVD.*

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PII-24

STUDY OPTOELECTRONIC PROPERTIES OF p-Cu_2O/n-ZnO NANOROD HETEROJUNCTIONS LAYER PREPARED BY ELECTROCHEMICAL METHOD

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Abstract.

p-Cu_2O/n-ZnO nanorod heterojunctions were fabricated by electrochemical method. The process was performed with deposition of n-ZnO nanorods on conductive indium gallium zinc oxide (IGZO) thin film, then deposition of p-Cu_2O to form p-Cu_2O/n-ZnO nanorod heterojunctions. The deposition conditions to fabricate the Cu_2O layer affected significantly the formation, microstructure, electronic, and optical properties of the heterojunctions layer. The structural morphologies of p-Cu_2O/n-ZnO nanorod interface also have meaningful effects to properties and energy conversion efficiency. XRD, SEM, PL, UV-VIS, I-V characteristics methods were used to define structure, optical, electronic properties of the heterojunctions layer. The p-Cu_2O/n-ZnO nanorod heterojunctions exhibited a well-defined p–n diode characteristic with high sensitivity to light and likely applied to solar cells.

Keywords: *Heterojunctions, electrochemical method, ZnO nanorod, diode characteristic, energy conversion efficiency.*

NGHIÊN CỨU TÍNH CHẤT QUANG ĐIỆN CỦA LỚP TIẾP XÚC DỊ THỂ p-Cu_2O/n-ZnO NANOROD ĐƯỢC CHẾ TẠO BẰNG PHƯƠNG PHÁP ĐIỆN HÓA

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Tóm tắt.

Lớp tiếp xúc dị thể p-Cu_2O/n-ZnO nanorod được chế tạo bằng phương pháp điện hóa. Quy trình chế tạo là lần lượt phủ một lớp ZnO nanorod lên điện cực dẫn trong suốt IGZO (ZnO pha tạp In và Ga), sau đó phủ thêm lớp Cu_2O để tạo thành tiếp xúc dị thể. Các điều kiện trong quá trình điện hóa Cu_2O có ảnh hưởng lớn đến cấu trúc, tính chất quang, tính chất điện của lớp tiếp xúc dị thể này. Bên cạnh đó, hình thái bề mặt của lớp tiếp xúc cũng ảnh hưởng lớn đến tính chất và hiệu xuất chuyển đổi quang điện. Các phương pháp phân tích như XRD, SEM, PL, UV-VIS, đặc trưng I-V cũng được sử dụng để xác định cấu trúc, tính chất quang, tính chất điện của lớp tiếp xúc. Kết quả cho thấy lớp tiếp xúc dị thể p-Cu_2O/n-ZnO nanorod thể hiện rất tốt đặc trưng của một diode chỉnh lưu, có độ nhạy sáng cao và có khả năng ứng dụng vào pin mặt trời.

Từ khóa: *ZnO nanorod, tiếp xúc dị thể, phương pháp điện hóa, đặc trưng diode chỉnh lưu, hiệu suất chuyển đổi quang điện.*

PII-25

MIXED ALKALI AND ALKALINE-EARTH EFFECT FROM THE ANOMALOUS CHANGE OF FLUORINE BORATE GLASSES

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Abstract.

Applications of the Judd-Ofelt theory to absorption, photoluminescence spectrum of RE^{3+} ion in the the fluoroborate glasses $xNaF.(89-x)B_2O_3.(11-y)Al_2O_3.yRE_2O_3$ and $xCaF_2.(89-x)B_2O_3.(11-y)Al_2O_3.yRE_2O_3$ (y = 1-3 mol%) with RE= Dy and Eu. They have been synthesized by the conventional melt quenching technique. We have observed a mixed alkali effect from the anomalous change of the glass: Judd-Ofelt (JO) parameters Ω_2, Ω_6, branching ratio β_R , Bonding parameter δ, the total radiative transition probability, A_T, radiative intensity ratio, R and radiative lifetime, τ with chemical components of the glasses under study. We have received some important informations for study fluorine Borate glasses.

HIỆU ỨNG DỊ THƯỜNG TRONG THUỶ TINH BORATE CHỨA HỖN HỢP FLUORIDE KIM LOẠI KIỀM HOẶC KIỀM THỔ

PII-26

STUDIES AND SYNTHESIS CsI:Tl CRYSTAL USED FOR GAMMA DETECTOR

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Abstract.

The CsI:Tl crystal was grown by the Bridgman method with high zone at temperature 700 ^{o}C and low zone at 500 ^{o}C, temperature gradient in the crystalline zone was 40 ^{o}C/cm. 99.9% purity CsI powder and 99.999% purity TlI powder were mixed and grown in system of crystal growth tube in argon gas.

In the study, the parameters were applied such as Tl-doped concentration was changed from 0.1% to 0.5% mol, the translating rate of crystal growth tube was changed from 2 – 5 mm/h. The study results showed that CsI:Tl single-crystals were clearly within 0.1 mol% and 0.2 mol% Tl-doped concentration. The properties of these CsI:Tl scintillation crystals had been tested by combining with PIN photodiode used for gamma detector.

Keywords: *Scintillation crystal, gamma detector, CsI:Tl.*

PII-27

THE ROLE OF RARE EARTH IONS Eu^{2+} AND Nd^{3+} IN $CaAl_2O_4$: Eu^{2+}, Nd^{3+} PHOSPHOR

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Abstract.

The phosphors of $CaAl_2O_4$: Eu^{2+}, Nd^{3+} (CAO: Eu^{2+}, Nd^{3+}) were synthesized by solution combustion method. The emission spectra of phosphors had broad band with maximium intensity at 440 nm, due to the electron transition from the $4f^65d^1$ to the $4f^7$ of Eu^{2+} ions. The crystalline structure of phosphors were confirmed by X-ray diffraction pattern (XRD), the monocline single phase of $CaAl_2O_4$ structure was detected. The concentration of rare earth ions Nd^{3+} co-doped has a strong influence on luminescent properties as well as the formation of the luminescent centers and the trappings of materials. Therein, the Eu^{2+} ions play the role luminescent centers and the Nd^{3+} co-doped ions act as hole traps, causing the long afterglow of phosphors. The emission of the materials were due to the contribution of the Eu^{2+} ions that occupy different positions in the crystal lattice.

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PII-28

PREPARATION AND CHARACTERIZATION OF GOLD, SILVER AND THEIR ALLOY FILMS FOR SERS SUBSTRATE

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Abstract.

One of special applications of plasmonics is the surface enhanced Raman scattering, it utilizes the creation of the higher localized light field in near field of nano structures of metal with the spontaneous of surface enhanced Raman scattering of suitable dye particles. By using rough chemistry of dye silver's surface, Possible Raman scattering of single particles is recorded, with measurable enhancement of scattering area with enhanced coefficient up to 10^{14}. Most of the enhancement is caused by the creation of high enhanced magnetic field in bonds of metal - dye as the result of the localized surface plasmon resonance. Creating special structures of metal dyes which have high enhanced Raman scattering coefficient and suitable plasmon active region in order to identify in single particle level is hihgly concerned all over the world. Gold films, silver films which have rough surface with the distance between islands under 10 nm are researched, fabricated and used for enhanced Raman scattering signal.

PII-29

MOLLOW SPECTRUM INFLUENCED BY COLLISIONS: A STOCHASTIC MODEL

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Abstract.

In this paper, using the idea introduced in [1] and developed in [2] we consider the influence of collisional fluctuations on optical phenomena. The fluctuations are taken into account by a simple shift of the constant detuning, involved in a set of optical Bloch equations by collision frequency noise which is modelled by a two-step random telegraph signal. This is a special case of the so-called pregaussian process introduced by Wódkiewicz and his co-workers [3-6]. Following that, the stochastic Bloch equations can be solved analytically in an exact way. Using these results we will consider in detail the spectrum for resonance fluorescence in the case of an arbitrary detuning of the laser frequency, in which velocity of the buffer gas remains constant and compare these results with that obtained in our previous paper [7].

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PII-30

ELECTRONIC STRUCTURES AND OPTICAL PROPERTIES OF N-DOPED TiO_2: A DFT CALCULATION

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Abstract.

In this research, first principles calculations were used to evaluate the electronic structures and optical properties of N-doped anatase TiO_2. Generalized Gradient Approximations (GGA) functional with Wu-Cohen (WC) parametrization has been used for exchange-correlation energy. Both substitutional and interstitial doping cases were calculated to compare the differences of their effects on N-doped TiO_2 properties. For each type of doping, different doping positions and concentrations were studied for more details. The results showed that the band-gaps of doped models were narrow, red shifting the absorption edges. Absorption coefficients of N-doped TiO_2 also calculated and discussed in the research.

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PII-31

EFFECT OF THE CORE SIZE AND SHELL THICKNESS ON THE OPTICAL PROPERTIES OF CdS/ZnSe TYPE-II CORE/SHELL NANOSTRUCTURES

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Abstract.

In CdS/ZnSe type-II core/shell nanostructures the photoexcited carriers are separated into the different spatial regions, namely the electrons reside primarily in CdS core and the holes in ZnSe shell. For this reason the type-II nanostructures are currently of high interest. Here, we show the effect of the core size and shell thickness on the optical properties of CdS/ZnSe type-II core/shell nanostructures. The samples were synthesized by seed growth. Their morphology, size, crystal structure and optical properties are investigated by transmission electron microscopy, X–ray diffraction, Raman scattering, absorption and photoluminescence spectroscopy. The obtained results indicate that the emission peak of indirect exciton shifts towards lower energy as increasing core size and shell thickness. The optical properties of CdS/ZnSe type-II core/shell nanostructures are discussed in relation to their size.

PII-32

FABRICATION AND OPTICAL PROPERTIES OF OPAL PHOTONIC CRYSTALS

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Abstract.

Photonic crystals (PhCs) are periodic structures of dielectric materials that can create a range of forbidden frequencies called photonic band gap (PBG). They have been extensively studied for various applications in photonics and optoelectronics. PhCs work for photons in a similar way that semiconductors do for electrons [1, 2]. Therefore, many concepts based on the electron phenomena may be extended to photon in PhCs. The great advance of the photon over the electron is its absence of mass and electrical charge. Artifical opal PhCs are the key examples because they can provide ideal platform to study various optical properties of new structures. Fabrication of opal PhC is usually based on the nature tendency, which is constructed from self-assembled colloidal spheres.

In this work, we synthesize silica (SiO_2) nanospheres following Stöber method [3]. The particle size of nanospheres can be well controlled by the amount of tetraethyl orthosilicate (TEOS). The opal PhCs with different lattice constant were fabricated using self-assembly method. Spherical and structural characterizations were conducted by scanning electron microscope. Their optical properties of photonic stop bands were analyzed via reflection spectra. The experimental results are good agreement with Bragg diffraction theory.

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PII-33

PHOTOCATALYTIC DEGRADATION OF METHYLENE BLUE ON TiO_2/CuO NANOCOMPOSITE SYNTHESIZED BY GRINDED METHOD

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Abstract.

A series of novel active photocatalyst of TiO_2/CuO composite were synthesized by simple grinded method using TiO_2 Degussa P25 and $Cu(NO_3)_2.3H_2O$ as chemical precursors. The physic-chemical properties of the resulting photocatalyst were comprehensively examined via XRD, Raman, FE-SEM, TEM, and UV-Vis spectroscopy. It was found that the crystal compositions of TiO_2 and CuO present in a hetero-nanostructure, that performs a broad visible-light absorption in comparison with TiO_2 P25. The photo-oxidation efficiency of obtained material was evaluated through the decomposition of methylene blue (MB) in aqueous solutions under visible-light irradiation. As a results, the experiment demonstrated the photocatalytic degradation rate of MB on resulting composite depends significantly on ratio of crystal compositions presented in material. Furthermore, the possible photo-decomposition mechanism was proposed and discussed. Above results showed that such composite material may be used to adjust the photo degradation property and may extend potential applications for degradation of organic pollutants.

Keywords: *photocatalyst, TiO_2/CuO, hetero-nanostructure.*

PII-34

ENHANCEMENT IN VISIBLE-PHOTOCATALYTIC ACTIVITY OF ZnO BY MIXING WITH MULTIWALLED CARBON NANOTUBES

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Abstract.

A nanostructure mixture of zinc oxide and multiwalled carbon nanotubes was prepared by chemical precipitation route. The resulting material was characterized using powder X-ray diffraction (XRD), field emission scan electron scanning (FE-SEM), and ultraviolet - visible reflective diffusive spectroscopy (UV-vis). It was found that carbon nanotubes were mixed well with the ZnO nanowire in diameter under 10 nm and length about 40 nm. The optical measurement indicated the highly light absorption in visible region of resulting mixture in comparison with pure ZnO. The photocatalytic activity of the mixture was tested by degradation of methylene blue (MB) and methylene orange (MO) as model dyes. The results demonstrated that ZnO/MWCNTs nano mixture effectively bleached out MB and MO, showing an impressive photocatalytic enhancement over nano ZnO and commercial ZnO. This remarkably enhanced photoactivity of nano mixture photocatalysts was attributed to greater dyes adsorptivity, extended light absorption and increased charge separation efficiency due to excellent electrical properties of carbon nanotubes.

Keywords: *ZnO, MWCNTs, nanomixture, photocatalysis.*

PII-35

SYNTHESIS AND STUDY THE CHARACTERISTICS OF THE Ni-DOPED $BiFeO_3$ MATERIALS

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Abstract.

Ni-doped $BiFeO_3$ nanoparticles were prepared by the sol-gel method. The characterization of materials has been performed using X-ray diffraction (XRD), ultraviolet-visible spectroscopy (UV/Vis), fluorescence spectroscopy and Vibrating Sample Magnetometer (VSM) measurement. The XRD analysis has been carried out to characterize crystal structure and to detect the impurities existing in these materials. The effect of introducing Ni^{2+} was to decrease the optical band gap for doped samples $BiFe_{1-x}Ni_xO_3$ ($x = 0.00 \div 0.15$). From VSM measurement results, these materials exhibited weak ferromagnetic behavior and the magnetization of the sample was increased as presence of Ni^{2+} ions. The origin of magnetic properties of materials were discussed in this report.

Keywords: *multiferroic, $BiFeO_3$, sol – gel, ferromagnetic.*

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PII-36

$PbTiO_3$-$CoFe_2O_4$ CORE/SHELL COMPOSITES SYNTHESIZED BY SOL-GEL PROCESS

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Abstract.

We investigate the phase structure, morphology, magnetism and the two phases contact on a molecule scale level of (1-x)$PbTiO_3$-x$CoFe_2O_4$(x=0.0-0.4) core/shell composites which were successfully formed by sol-gel process. Some techniques were applied such as X-ray diffraction pattern (XRD), scanning electron microscopy (SEM), high-resolution transmission electron microscopy (HRTEM), Raman scattering, and vibrating sample magnetometer (VSM). It is concluded that $CoFe_2O_4$ (CFO) phase well crystallize around $PbTiO_3$ (PTO) nanoparticles to form core/shell nanostructure. Two phases of PTO and CFO well mutually contact on a molecule scale level while the lattice constants of PTO phase almost well remain, leading to high ME coefficient and high ferroelectric polarization. The good contact of two phase was also confirmed by Raman scattering. The magnetism of core/shell composite increases remarkably with CFO content.

Keywords: *core/shell, composite, contact, sol-gel, magnetism.*

PII-37

INVESTIGATE THE CRYSTALLIZATION OF $ZrTiO_4$ SOL-GEL POWDER

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Abstract.

In the present work, $ZrTiO_4$ was obtained from titanium isopropoxide and zirconyl chloride octahydrate, at the Zr:Ti molar ratio of 1:1, in ethylene glycol, through the sol-gel process at ambient temperature (400, 600, 700 and 800 ^oC) for 3h. Thermal analysis, X-ray diffraction (XRD) patterns, scanning electron microscopy (SEM), optical absorption as well as photoluminescence (PL) were applied to characterize the crystallization of $ZrTiO_4$. The loss of mass due to the dehydration and the removal of organic compound were observed in two regions 200-400 ^oC and 400-700 ^oC. The crystallization of the orthorhombic phase $ZrTiO_4$ around 700 ^oC was also confirmed by XRD, optical absorption and photoluminescence.

Keywords: *sol-gel, crystallization, band gap, orthorhombic.*

PII-38

THE PHOTOLUMINESCENCE SPECTRA OF POLYNINYLPYRROLINDONE-COATED ZnS:Mn THIN FILMS

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Abstract.

Polyvinylpyrrolindone (PVP)-coated ZnS:Mn thin films have been synthesized by a spin coating method. The XRD patterns (XRD) showed that these thin films possess $T_d^2 - F\bar{4}3m$ cubic crystalline structure with average crystal size of about 2.5 nm. The photoluminescence spectra present a blue band at about 440 nm and a large yellow-orange band at about 603 nm with strong intensity. The blue band is assigned to vacancies of Zn, S and theirs interstitial, the yellow-orange band is assigned to the radiation transition in $3d^5$ unfulfilled electronic shell of Mn^{2+} ions [$^4T_1\ (^4G) \rightarrow {}^6A_1\ (^6S)$] in ZnS matrix. The dependence of the photoluminescence spectra on the volume ratios between ZnS:Mn and PVP, thin film layers and excitation power density of radiation have been reported.

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PII-39

INFLUENCE OF FREQUENCY CHIRP ON PULSE PARAMETERS FOR THE HYPERBOLIC-SECANT SHAPE INPUT LIGHT PULSE IN THE SATURABLE ABSORBER AND ACTIVE MEDIUM OF THE RING RESONATOR OF THE COLLIDING PULSE MODE LOCKING DYE LASER

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Abstract.

In the colliding pulse mode locking (CPM) ring dye laser, there are a lot of factors that influence in pulse formation ,pulse width and intensity of output laser pulses. In this report ,we present influence of linear and nonlinear frequency chirp on the pulse parameters in the **saturable absorber and active medium of the ring resonator** of the CPM ring dye laser. **The hyperbolic – secant shape** light pulse is used for calculating in detail.

Keywords: *linear and nonlinear frequency chirp,* ***hyperbolic-secant shape*** *pulse, ring resonator dye Laser, colliding pulse mode locking.*

PII-40

EFFECT OF HYDROTHERMAL TIME ON THE STRUCTURAL AND MAGNETIC PROPERTIES OF $BiFeO_3$ MATERIALS

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Abstract.

Single-phase bismuth ferrite ($BiFeO_3$) powders were synthesized with a hydrothermal method at the temperature 200 ^{0}C, with different hydrothermal time (1,5, 2, 4, 6, 8,10, 12 hours) by controlling the experimental conditions carefully. The powder structure, morphology, and composition were characterized by using X-ray diffraction (XRD), energy dispersive X-ray (EDX), scanning electron microscopy (SEM). Optical band gap decreases as hydrothermal time increases. Magnetic properties of $BiFeO_3$ materials were investigated by vibrating sample magnetometer measurements at room temperature, using maximum magnetic field of about 12 kOe. This report has showed the hydrothermal time affect the structure and magnetic properties of $BiFeO_3$ materials.

Keywords: *hydrothermal method, $BiFeO_3$, X-ray diffraction.*

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PII-41

PROPERTIES OF $ZnWO_4$ AND $ZnWO_4$/Ag MATERIALS

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Abstract.

$ZnWO_4$ and $ZnWO_4$/Ag materials with different concentration of silver were synthesised by the hydrothermal method. The prepared materials were characterized by X-ray diffraction measurement (XRD), scanning and transmission elecctron microscopy techniques (SEM-TEM), absorption spectra. SEM and TEM images showed that $ZnWO_4$ material has composed of rod-like crystals with a diameter of about 10 nm and length of 60-100 nm. Addition, some small spherical particles were observed over the rough surface in the TEM images of $ZnWO_4$/Ag, indicating that the silver particles were relatively uniform deposited on the surface of $ZnWO_4$. $ZnWO_4$ sample exhibited high photocatalytic activity for the degration of methylene blue (MB) under UV light irradiation. $ZnWO_4$ photocatalyst shows that approximately 97% of MB 5 ppm was degraded after 3.5 hrs light. However, under visible light irradiation, MB photodegradation activity of $ZnWO_4$/Ag material was higher than $ZnWO_4$.

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PREPARATION AND STUDY ON OPTICAL PROPERTIES OF NANOCOMPOSITE POLYPYRROLE/TiO_2 MATERIALS

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Abstract.

A nanocomposite of polypyrrole/TiO_2 is synthesized by in situ chemical polymerization at 0 ÷ 5 ^oC and examined optical properties. The result of surface formation examined by scanning electric microscope (SEM) and transmission electron microscopy (TEM) shows TiO_2 particles with 3 ÷ 4 nm in size are coated the sphere shaped polypyrrole particles 30 ÷ 50 nm. The polypyrrole oxidation state which depends on volumn porpotion of TiO_2 mixing in nanocomposite polyrrole/TiO_2 is examined by infrared spectrum and Raman spectra. Nanocomposite of polypyrrole/TiO_2 materials examined by DSC heat analysis is also shown in this article.

CHARGE SEPARATION BY INDIRECT BANDGAP TRANSITIONS IN TYPE-II CdS/ZnSe CORE/SHELL NANOSTRUCTURES

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Abstract.

The type –II CdS/ZnSe core/shell nanostructures (NSs) were fabricated in a two-step procedure by growing ZnSe shell caps onto facets of CdS core. The type –II CdS/ZnSe core/shell NSs samples are synthesized with increasing thickness of ZnSe shell on CdS core. In these CdS/ZnSe core/shell NSs samples, a new energy band lower than the energy gap of both the CdS core and ZnSe shell has been observed and attributed to indirect bandgap transitions from the valence band of the ZnSe shell to the conduction band of the CdS core. The photoluminescence (PL) and decay PL studies have revealed that the indirect type exciton, e(CdS)/h(ZnSe) due to photoexcitation of this lowenergy band, endures less carrier trapping than selective excitation of the CdS core and charge transfer in the staggered photoexcited state.

Keywords. *Nanostructures, indirect bandgap transitions, photoluminescence*.

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PII-44

TEMPERATURE AND EXCITATION POWER DEPENDENCE OF THE OPTICAL PROPERTIES OF TYPE-II CdS/ZnSe CORE/SHELL NANOCRYSTALS

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Abstract.

We have investigated the optical properties of type –II CdS/ZnSe core/shell nanocrystals (NCs). The CdS/ZnSe NCs exhibit a type-II transition arising from electrons localized in the CdS core region and holes delocalized in the ZnSe shell. Their luminescence spectra were measured in dependence on the excitation power density ranging from 0.64 to $7x10^3$ W/m^2. Temperature-dependent PL spectra of the CdS/ZnSe NCs were investigated in the temperature range from 15 to 300 K. It is found that the temperature-dependent spectral characteristics containing the emission intensity, energy and full width at half maximum (FWHM) of type-II NCs are different from those of type-I ones. The results are analyzed and discussed in term of the separation of charge carriers into different spatial regions and the temperature-dependent strain in type - II core/shell NCs.

Keywords. *Nanocrystals, separation of charge carriers, luminescence.*

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PII-45

EFFECT OF COUPLING TO OPTICAL CHARACTERISTICS OF MICRO-RESONATOR

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Abstract.

Coupling between optical waveguides is well established in literature [1]. The different types of couplers are applied in various configurations such as switches, microring resonators, and microtoroidal resonators [2-6]. In this paper, we will investigate the power coupling between waveguides with different geometry. We also analyze the effect of scattering loss of waveguide to quality factor Q in regard to the surface roughness of waveguide decreasing using post-processing such as hydrogen annealing. The variety of critical resonant condition in the micro-resonator with regard to changing the shape of waveguides is studied. Geometry and coupling-induced wavelength shift is also investigated. Our investigations are based on the microring resonator.

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PII-46

EFFECT OF THERMAL ANNEALING ON OPTICAL PROPERTIES OF THE CARBON-DOPED ZnO

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Abstract.

Carbon-doped ZnO samples with *good quality crystals* were prepared by high-energy ball milling technique and annealed at different temperatures in Ar gas environment. The crystal structure, surface morphology, chemical bonding and optical properties of the obtained samples were investigated by field emission scanning electron microscopy (FESEM), X-ray diffraction (XRD), Fourier transform infrared (FTIR) and Photoluminescence (PL) spectroscopy measurements at room temperature. The effect of annealing temperature on the optical properties of 3% weight C-doped ZnO (3% C) samples was studied in details. The X-ray diffraction studies demonstrate that the ZnO:3% C sample has single phase wurtzite structure with no secondary phases [1-3]. However, the positions of diffracted peaks slightly shifted towards larger (2θ) angles when comparing to that of C-doped and undoped ZnO samples. The optical of the ZnO:3%C sample depends strongly on annealing temperature. PL measurements at room temperature of 3%C sample reveals that the ratio of UV and visible emission intensity (I_{UV}/I_{Vis}) increases with increasing the annealed temperature from 200 ^{0}C to 800 ^{0}C and decreases after annealing at 1000 ^{0}C. These results suggest that the annealed temperature of 3%C sample plays an important role in increasing the quality of ZnO crystals. This study could lead to an alternative way for preparing ZnO material for opto-electronic applications.

Keywords: *Carbon-doped ZnO; ZnO particles.*

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PII-47

GEOMETRY OPTIMIZATION OF HEAT SINK FOR HEAT DISSIPATION OF THE COB LEDs BY CFD THERMAL SIMULATION

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Abstract.

The current paper introduces an effective numerical technique for geometric optimization of heat sink for heat dissipation of chip-on-board (COB) light-emitting diodes (LEDs) using computational fluid dynamic simulation (CFD). The heat generation in COB LEDs was substituted for the constant heat flux on the bottom surface of the chip, and it is consistent with power input of COB LEDs. Heat should dissipate through only surface between a heat source and a heat sink. Initially, in order to get the optimal working temperature, the total luminous flux of COB LEDs are measured by using an integrating sphere system (VMI-PR-001) with various temperature on the top surface of heat sink. An then, based on the given specifications, a conceptual model was developed using AUTOCAD program. Later on, the inner volume of this model was developed using GAMBIT software. Then after, the simulation of the volume of heat sink was done using ANSYS FLUENT, followed by its optimization. The effect of heat sink design was considered. When calculating the thermal dissipation, we used the maximum temperature on the top surface at the center of heat sink about 55^{o}C to optimize the geometry of heat sink. Testing of the prototype is carried out for the validation of simulated results. The results obtained from test are compared with the simulated results and found to be similar to each other.

Keywords: *COB LEDs measurement, integrating sphere, luminous flux, $BaSO_4$, computational fluid dynamic simulation, temperature, thermal dissipation.*

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PII-48

CATHODOLUMINESCENCE STUDY OF ZnS/ZnO NANOBELTS HETEROSTRUCTURES

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Abstract.

ZnS/ZnO nanobelts heterostructure are synthesized on Si/Au substrate by thermal evaporation of ZnS powder at 1150 ^{o}C and post oxidation at 500 ^{o}C in oxygen gas environment. Cathodoluminescence (CL) measurements of the as-received samples carried out and shown two prominent UV peaks at 336 and 370 nm corresponding to the near-band edge (NBE) transitions of ZnS and ZnO phase. The well-known defect-related emission (which often seen in the PL spectra of ZnS nanobelts) with the peak at ~520 nm was also observed. After oxidation, CL intensity of the ZnO-related peak is increased and the PL intensity of the ZnS-related peak reduced, we conclude the ZnS-ZnO transformation process happens in the nanobelts because of thermal oxidation. Moreover, we also observed a new emission band in the red region with a peak around 600 nm. This emission could be interpreted as the defect-related emission in the newly formed ZnO phase of the nanobelts.

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PII-49

MAl_2SiO_4: Eu^{2+} PHOSPHOR FOR WHITE LED-BASED NEAR-UV CHIP: PREPARATION, CHARACTERIZATION AND LUMINESCENT MECHANISM

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Abstract.

In this work, we report preparation of phosphors MAl_2SiO_4: Eu^{2+} (M: Ca, Ba, Sr) by co-precipitation method for white-light emitting diode (WLED) - based near - UV chip. The characterization and luminescent mechanism were investigated. The phases of the as-prepared samples were identified by X-ray powder diffraction spectroscopy (XRD). The morphology of the phosphors was taken with a file emission scanning electron microscopy (FESEM). The optical properties of the phosphor were showed by photoluminescence (PL), PL-excitation (PLE) measurements. Under the excitation of near-UV light (370 nm), the emission spectra of these phosphors exhibited broad emissions peaked at 440 nm, 500 nm and 510 nm. The emissions belong to the d–f transition of Eu^{2+} ion which replaced the positions of M^{2+} ion. The relationship between the emission wavelengths and the occupation of Eu^{2+} at different host lattice was studied. It was found that the nominal composition MAl_2SiO_4: Eu^{2+} is the optimal composition for single-phased white-light phosphors. The CIE chromaticity calculation demonstrated its potential as WLED-based near-UV chip.

This work was supported by the Solid State Lighting Program (Vietnamese Ministry of Education and Training) Project No. B2013-01-59-CT.

PII-50

OPERATION OF ACOUSTO-OPTIC Q-SWITCH IN LASER MAKING SYTEMS

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Abstract.

Operation of acousto-optic devices are based on mutual interaction between an ultrasonic wave and a light beam in a scattering medium. They have been used in a variety of laser intra-cavity applications for the electronic control of the intensity (modulation) and or position (deflection) of the laser beam. One of the beam modulation applications is acousto-optic Q-switching. In this article, we present the results of using acousto-optic Q-switch in a Nd:YAG laser system to generate short duration, high-peak power pulses and control output laser beam. This laser system operates at maximum power of 40 W, Q-switch frequency of 50 kHz and pulse width of 50 μs for applications of laser making on metal surfaces.

Keywords: *acousto-optic Q-switch, Nd:YAG laser, laser making.*

PII-51

INFLUENCE OF FREQUENCY CHIRP ON PULSE PARAMETERS FOR THE GAUSSIAN SHAPE LIGHT PULSE IN THE SATURABLE ABSORBER AND ACTIVE MEDIUM OF THE RING RESONATOR OF THE COLLIDING PULSE MODE LOCKING DYE LASER

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Abstract.

There are a lot factors that influence in pulse formation, pulse width and intensity of output laser pulses in the colliding pulse mode locking CPM ring dye laser. In this report, we present influence of linear and and nonlinear frequency chirp on the pulse parameters in the **saturable absorber and active medium of the ring resonator** of the CPM ring dye laser. **The Gaussian shape** light pulse is used for calculating in detail.

Keywords: *linear and nonlinear frequency chirp shape pulse, **The Gaussian**, ring resonator dye Laser, colliding pulse mode locking.*

PII-52

OPTICAL PROPERTIES OF NANOCOMPOSITE Au@ZnO FILMS MADE BY THERMAL EVAPORATION

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Abstract.

Au@ZnO composite nanoparticle thin films were prepared by evaporation of Au thin layer on the top of ZnO nanostructure films, after that the samples were annealed at 40 ^{o}C for 2h in air. The results from SEM images of the Au@ZnO films indicated that after annealed the Au atoms were concentrated to form au nanoparticles and dispersed on the surface of ZnO films. Average size of the Au nanoparticle could be controlled bay thickness of the Au layer and changes from 10 to 25 nm. The plasmon resonance absorbance of gold particles was observed clearly with peak position of about 520 nm. Beside that the photoluminescence of Au@/ZnO films was investigated and shown strong influence of Au nanoparticle size to the fluorescent properties of the material systems.

PII-53

PHOTOLUMINESCENT PROPERTIES OF $LaPO_4:Eu^{3+}$ AND $La_3PO_7:Eu^{3+}$ NANOPHOSPHORS PREPARED BY COMBUSTION SYNTHESIS

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Abstract.

Eu^{3+}-doped $LaPO_4$ and La_3PO_7 nanophosphors were prepared via combustion synthesis using urea as fuel and metal nitrates as precursor. Structures, morphologies, and photoluminescent properties of the $LaPO_4:Eu^{3+}$ and $La_3PO_7:Eu^{3+}$ were studied by X-ray diffraction, scanning electron microscopy, photoluminescent and excitation photoluminescent spectra. The average diameters for the phosphor particles are 5 - 20 nm. The effects of Eu^{3+} doping process and heating temperature on optical properties of nanophosphors have been investigated. The strong red-emission intensity peaking at 620 nm originates the $^5D_0$-$^7F_2$ transition and is observed under 266 nm excitation, indicating that Eu^{3+} ions in La_3PO_7 mainly occupied non-inversion sites while $LaPO_4:Eu^{3+}$ phosphors show the intense peak at 594 nm corresponding to the $^5D_0$-$^7F_1$ transition of Eu^{3+} in inversion symmetry sites.

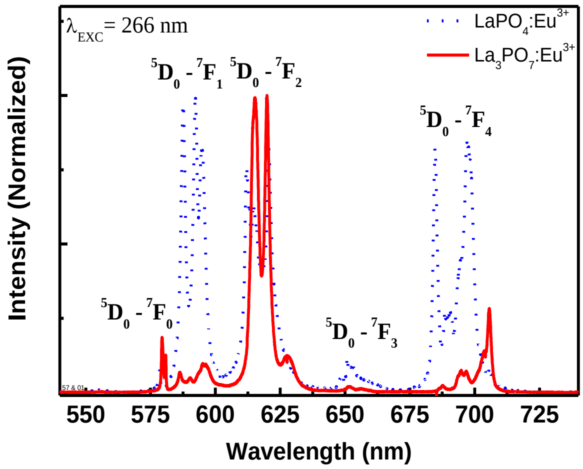

Fig. 1. *Photoluminescent spectra of $LaPO_4:Eu^{3+}$ and $La_3PO_7:Eu^{3+}$ nanoparticles under 266 nm excitation.*

PII-54

COMBUSTION SYNTHESIS AND CHARACTERIZATION OF Eu^{3+}-DOPED YbO_3 NANOPHOSPHORS

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Abstract.

YBO_3:Eu^{3+} nanomaterials were prepared via combustion synthesis using urea as fuel and metal nitrates as precursor. The morphology and the structure of the prepared samples were characterized by X-ray diffraction, scanning electron microscopy and transmission electron microscopy. The average size of the prepared materials ranged from 20 to 40 nm in diameter. The effects of Eu^{3+} doping concentrations and heating temperature on structure and optical properties have been investigated. YBO_3:Eu^{3+} shows orange-red emission under an excitation at 266 or 325 nm. The photoluminescent spectra of YBO_3:Eu^{3+} are described by the well-known $^5D_0$-^7F_J transition (J = 1, 2, 3, 4) of Eu^{3+} ions with the strongest emission in the red region for J = 1. Strong emission from these materials is promising for solid lighting applications.

PII-55

EFFECT OF NITROGEN-DOPED AND (NITROGEN, TANTALUM) CO-DOPED ON TiO_2 PHOTOCATALYTIC FILMS

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Abstract.

Nitrogen and tantalum co-doped TiO_2 films were fabricated by hydrothermal method, followed by calcination at 300 ^{o}C. Their structure, morphology and photocatalytic properties were compared to those of pure TiO_2 and nitrogen doped TiO_2. The materials were characterized by Xray, SEM and UV-VIS. X-ray diffraction patterns and SEM pictures show that all the obtained samples are TiO_2 anatase single phase with particle size of about 20 nm. UV-VIS spectra found that the dopants cause a significant red shift of the absorption edge. Nitrogen and tantalum co-doped TiO_2 have high visible light photocatalytic, a lower band gap resulting from effective nitrogen, tantalum co-doping.

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PII-56

STRUCTURE AND OPTICAL CATALYST PROPERTY OF SILICON NANOPARTICLES PRODUCED USING A PLANETARY BALL MILL

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Abstract.

Silicon micropowders have been reduced in nanometric particles in top-down synthesis route by using a planetary ball mill. Micropowders were grinned for a long time and took out in a each 6 hour. In this paper, the grinning process was caried out for 54 hours. The structure and morphology of as-fabricated Si powders were fully characterized by XRD and SEM measurements. These Si powders were also used to experiment oxidize the basic dye methylene blue (MB) under the blue light. After reaction time, the colour degradation of MB were observed for most samples.

Keywords: *Si nanoparticles, optical catalyst, planetary ball mill.*

PII-57

DEVELOPMENT OF A DISTRIBUTED FEEDBACK DYE LASERS FOR DIFFERENTIAL ABSORPTION LIDAR MEASUREMENT OF OZONE IN THE LOWER ATMOSPHERE

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Abstract.

The Differential Absorption Lidar (DIAL) offers a efficient way to measure ozone variability in lower atmosphere at high spatial and temporal resolution for both short and long term studies. Normally, two UV wavelengths using in DIAL system for measuring ozone concentration result from or Raman bachscattered signals on nitrogen and oxygen [1], hydrogen (H_2) and deuterium (D_2) Raman cells [2], or two Rhodamine dye lasers with the wavelength selectors [3]. In this paper, a new transmitter for use in DIAL system to measure variation of atmospheric ozone is proposed. This transmitter of lidar system consists of two Distributed Feedback (DFB) Dye Lasers with two separate active mediums (Rhodamine 6G and Rhodamine B), pumped by a 5 ns Nd:YAG pulsed laser operating at 532 nm wavelenght. The BBO crystals are used in this system for doubling of pulse of DFB dye lasers. This system has been set up and generate selected wavelenghts at 280 nm and 290 nm with the pulse width 20 ps and the energy ~100 μJ/pulse. Our DIAL system with this new transmitter is foreseen to provide the first daytime and nighttime ozone vertical profiles during early winter 2014 in Vietnam.

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PII-58

INFLUENCE OF FREQUENCY CHIRP ON PULSE PARAMETERS FOR THE HYPERBOLIC-SECANT SHAPE INPUT LIGHT PULSE IN THE SATURABLE ABSORBER AND ACTIVE MEDIUM OF THE RING RESONATOR OF THE COLLIDING PULSE MODE LOCKING DYE LASER

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Abstract.

In the colliding pulse mode locking (CPM) ring dye laser, there are a lot of factors that influence in pulse formation ,pulse width and intensity of output laser pulses. In this report, we present influence of linear and nonlinear frequency chirp on the pulse parameters in the **saturable absorber and active medium of the ring resonator** of the CPM ring dye laser. **The hyperbolic – secant shape** light pulse is used for calculating in detail.

Keywords: *linear and nonlinear frequency chirp,* ***hyperbolic-secant shape*** *pulse, ring resonator dye Laser, colliding pulse mode locking.*

PII-59

STUDY OF ION-PARING STRUCTURE IN AQUEOUS RbCl USING A COMBINED EXAFS AND XRD METHOD

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Abstract.

We applied a new method that combines Extended X-ray absorption fine structure (EXAFS) and X-ray diffraction (XRD) techniques [1] to study the hydration and ion-pairing structure of Rb^+ and Cl^- ion in water. The simultaneous refinement of the complementary EXAFS and XRD data provides a more accurate hydration structure of the monovalent ions. It was found that at high concentration (6 m) of RbCl direct contact ion pair between Rb^+ and Cl^- ion is formed. The refinement of differential EXAFS of high and low concentration and XRD data yield 1.3 pair of RbCl spaced by 3.237 ± 0.029 Å, whereas 1.7 pair bonded at 3.241 ± 0.046 Å are derived from a full EXAFS and XRD refinement. This result will improve interaction potential of Rb^+-Cl^- for a better description of ion-pair formation in molecular dynamics (MD) simulation.

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