EuroSciCon

DAY 1

Scientific Tracks & Abstracts

EuroSciCon Joint Event on

Laser Optics & Photonics and Atomic & Plasma Science

July 16-17, 2018 Prague, Czech Republic

DAY 1

July16, 2018

Sessions

Optical Communications and Networking | Atmospheric Optics| Optoelectronics | Optics and Lasers in Medicine | Surface Enhanced Spectroscopy | Biophotonics | Optical Physics | Nuclear Science

Session Chair
Aleksey Mikhailovich Polubotko
A. F. Ioffe Physico-Technical Institute, Russia

Session Co-Chair
Georgii Malashkevich
B.I. Stepanov Institute of Physics, Belarus

Session Introduction

Title: Antimonide quantum materials for laser applications
Qian-Dong Zhuang, Lancaster University, UK

Title: A new spectroscopy based upon 3D photonic quantum ring lasers for non-invasive and portable brain heart disease diagnostic techniques
O'Dae Kwon, POSTECH University, South Korea

Title: Self-assembled organic/polymeric micro lasers and photo switchable arrays
Yohei Yamamoto, University of Tsukuba, Japan

Title: Iterative method of dual-wavelength laser ratio for particle spectrum
Cao Nianwen, Nanjing University of Information Science & Technology, China

Title: Optimized Synthesis and Assessment of Fluorescent Dye-Labelled Nanosystems
Katel Herve-Aubert, University of Tours, France

Title: Analytical commutation of electrical equalizer in on-off-keying optical communication systems
Gilad Katz, Holon Institute of Technology, Israel

Title: Growth and characterization of epitaxially grown GaN layer on patterned sapphire substrate
Ismail Altuntas, Cumhuriyet University, Turkey

Title: The role of growth temperature, V/III ratio and CBr4 flow on carbon doped p-GaAs epilayers
Alev Kizilbulut, Cumhuriyet University, Turkey

Title: Laser-assisted precipitation of metal and semiconductor nanoparticles in oxide glass
Maxim Vetchinnikov, Mendeleev University of Chemical Technology, Russia

Title: Ultrafast laser-induced inscription of nanogratings in alkali silicate glasses
Sergey Fedotov, Mendeleev University of Chemical Technology, Russia

EuroSciCon Joint Event on
Laser Optics & Photonics and Atomic & Plasma Science

July 16-17, 2018
Prague, Czech Republic

Q Zhuang et al., Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

ANTIMONIDE QUANTUM MATERIALS FOR LASER APPLICATIONS

Q Zhuang[1, 2], Z M Jin[1], P Hodgson[1], H Manus[1], Z M Wang[2] and A M Sanchez[3]
[1]Lancaster University, UK
[2]Institute of Fundamental and Frontier Sciences-UESTC, China
[3]Warwick University, UK

Antiminide materials are featured with their large spin-orbit splitting energy, that could supress the Auger recombination consequently advance in the applications for lasers. However, its combination with arsenide materials always constructs a hole-confinement type-II band alignment, which reduces electron-hole wave-function overlap and makes them less attractive for use in lasers. Use of quantum ring (QR) and quantum dot (QD) geometries in antimonide/arsenide heterostructures, produces strong Coulomb binding of electrons to the positively charged QR/QD which allows efficient radiative recombination resulting in photoluminescence emission up to 400 K. In addition, the QR/QD of GaSb/GaAs offers room temperature emission wavelengths in the commercially important 1260-1675 nm telecom bands, while InSb/InAs QD provides emission wavelengths in the important mid-infrared range (2.0-5.0 um). In this talk, I will review our recent research achievements in GaSb/GaAs QR lasers for telecom use and InAs/InAs QD mid-infrared lasers. Furthermore, I will discuss the quantum structures of GaSb disks embedded in GaAs nanowire and their potential applications in single photon emissions

Biography

Q Zhuang has completed his PhD from the Institute of Semiconductors, CAS, China in 1999. He is a Senior Lecturer in the Physics Department at Lancaster University, UK. He is the group leader of MBE Research Laboratory where he has been leading the research in MBE grown semiconductor nanostructures. His current research is focused on novel dissimilar alloys, quantum dots, nanowires, semiconductor/graphene hybrid material systems, ranging from MBE epitaxial growth to development of optoelectronics through fundamental physics studies. He has published 2 book chapters and more than 70 papers in peer-reviewed scientific journals including *Nano Letters, Nature Communication, Nanoscale, Applied Physics Letters and Physical Review* B. He is an Editorial Member of *Nature Scientific Reports*.

q.zhuang@lancaster.ac.uk

O'Dae Kwon, Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

A NEW SPECTROSCOPY BASED UPON 3D PHOTONIC QUANTUM RING LASERS FOR NON-INVASIVE AND PORTABLE BRAIN/HEART DISEASE DIAGNOSTIC TECHNIQUES

O'Dae Kwon
POSTECH, South Korea

The photonic quantum ring (PQR) lasers consist of cylindrical mesas of multi-quantum well (MQW) active region between top and bottom DBR structures. PQRs create the resonant double helix standing waves (CW and CCW) of the 3D donut cavity because it is 3D version of Lord Rayleigh's 2D whispering gallery mode (WGM). The room-temperature PQR thresholds are in the micro-ampere range for active diameters less than 20μm. The GaAs PQR then exhibits 3D spectra of apex-angle-dependent blue-shifts in the 20–30 nm range (795-765nm major peaks) as shown in Fig.1, implying that it is possible to extend continuously the PQR's tunable frequency ranges in 20nm steps from 700 to 980nm, to cover almost all interesting ionic IR frequency ranges, quite different from the usual functional near-infrared spectroscopy (FNIRS) being confined to single or few frequencies, for instance, for oxy/deoxy hemoglobin studies. Employing multiple 3D angle-tuning PQR measurements, we may go to hemodynamic or other ionic transport studies for various brain/heart diseases in the near future.

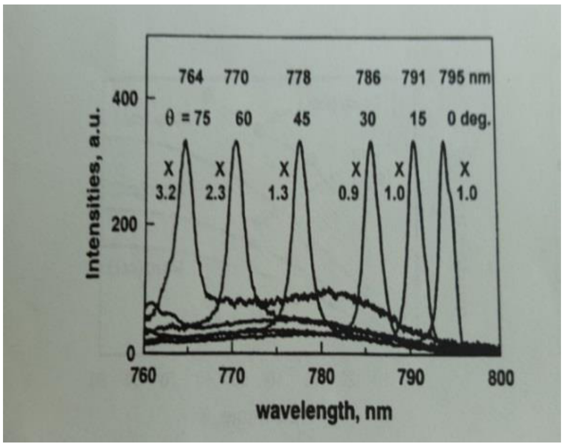

Figure: 1 The active MQWs between the two DBR regions of the PQR device described in the beginning generate spectral peaks of both PQR and VCSEL resolved with a microprobe made of a tapered single modefiber and a spectrum analyzer (HP model 70951A), where the angle-dependent PQR emissions are inseparable from that of the VCSEL, because of data overlapping due to a monitoring microscope placed right above the device)

O'Dae Kwon, Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

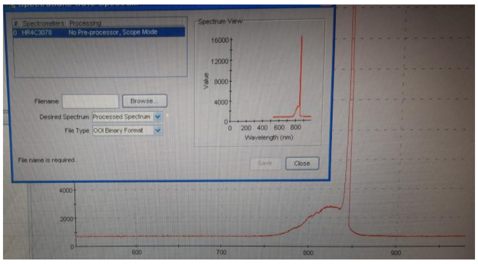

Figure: 2 A rough example can be seen from the first 845nm spectral data taken from cortical (frontal lobe) test measurements: A normally incident beam from PQR laser chip produced a reduced (~10%) beam

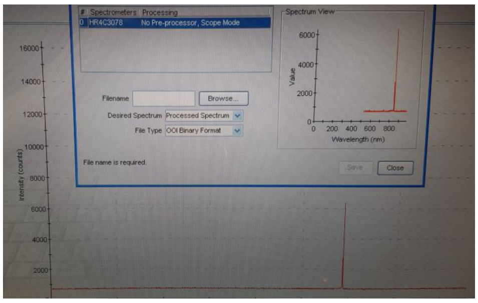

Figure. 3 A normally incident beam from PQR laser chip bounced back from front cranial region. Although not a good chip package for any cortical trials, we still tried since the current chip package of a 64x64 hole PQR array is proper for in vivo transmission tests with outer ear, and it seems promising. In doing so the emission power was moderately raised for the measurements and peak resolutions (incident 842 nm and outgoing 838 nm) are not yet clearly understood. Again this result is interesting although we cannot pinppoint certain ionic presence. We have to improve the situation further for example with pulsed operations

Recent Publications

1. B H Park, S D Baek, J Y Kim, J Bae and O Kwon (2002) Optical sensing by using photonic quantum ring lasers and resonance enhanced photodetectors. Opt. Eng. Vol. 79, pp. 1339-1345.

2. B H Park, J Bae, M J Kim, and O Kwon (2002) Chiral wave propagation manifold of the photonic quantum ring laser. Appl. Phys. Lett. Vol. 81, pp 580-582.

3. C Ahn, H Y Kang, and O Kwon (1998) Angle-dependent multiple-wavelength radial emissions in a toroidal microcavity: (A photonic quantum ring laser), SPIE, Vol. 3283, pp.241-251

4. J C Ahn et al (1999) Photonic Quantum Ring. Phys. Rev. Lett. Vol. 82, No.3 pp 536-539.

5. J Bae, J Lee, Kwon, and V G Minogin (2003) Spectrum of three-dimensional photonic quantum-ring microdisk cavities: comparison between theory and experiment. Opt. Lett. Vol. 28, No. 20, pp 1861-1863

Biography

O'Dae Kwon is a Professor Emeritus at POSTECH. He received his BS from Seoul Natl. Uniersity in 1969; MS in 1975 and PhD in 1978 from Rice University; He has worked at Cornell University from 1978-82, at Dow Research Center from 1983-86 and currently at POSTECH since 1986. He visited AT&T Bell Lab during 1993-94, UCL in 2000-01. He won the Scientist of the Year 1998 in Korea and Best paper award, IEEE NMDS 2007. He wrote 2 Phys Rev Letts and over 70 papers (30 papers on PQR lasers). He is interested in Optics and Quantum Devices and Theories.

odkwon@postech.ac.kr

Yohei Yamamoto, Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

SELF-ASSEMBLED ORGANIC/POLYMERIC MICRO LASERS AND PHOTO SWITCHABLE ARRAYS

Yohei Yamamoto
University of Tsukuba, Japan

Optical micro cavities play an important role for the next-generation light technology. Recently, we succeeded in fabricating spherical microcavities from π-conjugated polymers (CPs) by simple self-assembly process. We found that the microcavities exhibit whispering gallery mode (WGM), resonant photoluminescence (PL) upon focused laser excitation, where PL generated inside the sphere is confined via total internal reflection at the polymer/air interface. The resonance occurs when the wavelength of the light is an integer multiple of the circumference of the microsphere. The CP-based microcavities have benefits to the conventional microcavities in the following points: simple and low-energy fabrication process to obtain well-defined microspheres, the micro cavities act as both cavity and emitter, the micro cavities possess high refractive index and photo absorptivity, potent use for electrically-driven WGM and laser oscillation. In this presentation, recent results on the fundamentals of the self-assembly of the CPs, resonant PL from the CP microspheres, intra- and inter-sphere light energy conversion, and optically-pumped lasing will be discussed. Photo-switchable WGM, mode splitting, and microdisk arrays are also presented.

Biography

Yohei Yamamoto has completed his PhD from Osaka University and Post-doctoral studies in the University of Tokyo and Japan Science and Technology Agency. He moved to University of Tsukuba on 2010 as Assistant Professor, and then promoted to Full Professor on 2018. He has published more than 60 papers in reputed journals. His research interests are self-assembly of molecules and polymers to form microcavities for lighting and lasing.

yamamoto@ims.tsukuba.ac.jp

Nianwen Cao et al., Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

ITERATIVE METHOD OF DUAL-WAVELENGTH LASER RATIO FOR PARTICLE SPECTRUM

Nianwen Cao and Sipeng Yang
Nanjing University of Information Science and Technology, China

This paper presents a method to obtain the aerosol lidar ratio and particle spectrum simultaneously using a dual-wavelength lidar when the aerosol particles meet the Junge distribution. It analyzes the relationship between the aerosol particle ratio, particle spectrum and particle complex refractive index. The results show that the particle properties will have a great impact on the lidar ratio. If the selected lidar ratio is not suitable, the two-wavelength extinction coefficient obtained from the Fernald method is directly used for inversion of the particle spectrum, which will cause great uncertainty. In this paper, a lidar ratio iteration method is introduced to solve the influence of improper lidar ratio selection on particle spectrum inversion, then conducted simulation calculations and analysis. The simulation results show that the lidar ratio iteration method effectively solves the problem of uncomfortable lidar ratio selection, and can obtain relatively accurate lidar ratio and particle spectrum parameters at the same time.

Biography

Nianwen Cao has completed his PhD from Anhui Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, in 1999. He is Professor and engaged in Atmospheric Remote Sensing Research by Lidar in Nanjing University of Information Science and Technology. He has published more than 30 papers in reputed journals.

nwcao@nuist.edu.cn

EuroSciCon

EuroSciCon Joint Event on

Laser Optics & Photonics and Atomic & Plasma Science

July 16-17, 2018
Prague, Czech Republic

G Katz et al., Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

ANALYTICAL COMMUTATION OF ELECTRICAL EQUALIZER IN ON-OFF-KEYING OPTICAL COMMUNICATION SYSTEMS

G Katz and D Sadot
[1]Holon Institute of Technology, Israel
[2]Ben-Gurion University of the Negev, Israel

Chromatic dispersion is a critical factor that limits the quality of the received optical signal in high speed fiber optic communication systems. Chromatic dispersion introduces pulse broadening of transmitted signal and occurs due to the propagation delay variance of different spectral components of the transmitted signal. In order to minimize the performance degradation caused by pulse distortion and broadening, dispersion compensation is needed. Electrical dispersion compensation equalizer is a key and cost-effective element in optical communication systems in the presence of chromatic dispersion. The equalizer coefficients can be calculated or estimated adaptively according to an optimization criterion. There are two common optimization criteria, the zero forcing and minimum mean square error (MSE), where the latter is found to be more useful as it considers the noise enhancement. For the MSE criterion the equalizer coefficients can be estimated adaptively using the least mean square (LMS) method or analytically calculated using Wiener solution. In most researches of optical communication systems, the equalizer coefficients were estimated adaptively by using the LMS method. Here, an analytical solution is established for the electrical equalizer coefficients in on-off-keying optical communication systems. The solution is based on minimum MSE. The analytical results show a perfect match with computer simulation. In addition BER performance comparison with the adaptive LMS method reveals that the analytical solution performs better due to LMS excess MSE.

Biography

G Katz received his PhD degree in Electrical and Computer Engineering from Ben Gurion University in Israel in 2006. In 2000 he finished his MA on the subject of optical coherent multiplexing CDMA. From 2000-2003, he worked as Electrical Engineer in the Free Space Optics Field, developing a sophisticated laser transmitter and optical receiver. In his PhD during 2003- 2006, he has investigated electrical digital signal processing (DSP) techniques to mitigate intersymbol interference (ISI) effect in optical communication systems. This research led to a startup company in 2006, MultiPhy which today is a leading company that develops the next generation ICs at 100Gbps and 400Gbps for fiber optic networks. From 2016, he conducts his research and functions as a Lecturer at Holon Institute Technology, Israel. He has published more than 20 papers on subjects as DSP for optical communication systems, DSP for free space optics and more.

giladka@hit.ac.il

DAY 1

Young Research Forum

EuroSciCon Joint Event on

Laser Optics & Photonics and Atomic & Plasma Science

July 16-17, 2018 Prague, Czech Republic

EuroSciCon

EuroSciCon Joint Event on
Laser Optics & Photonics and Atomic & Plasma Science

July 16-17, 2018
Prague, Czech Republic

I Altuntas et al., Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

GROWTH AND CHARACTERIZATION OF EPITAXIALLY GROWN GAN LAYER ON PATTERNED SAPPHIRE SUBSTRATE

I Altuntas[1, 2], I Demir[1, 2], A A Kizilbulut[3], B Bulut[3] and S Elagoz[1, 2]

[1]Cumhuriyet University, Turkey
[2]Nanophotonic Research and Application Center, Cumhuriyet University, Turkey
[3]ERMAKSAN optoelectronic AR-GE, Turkey

GaN based materials including light emitting diodes, blue laser diodes and high-power microwave transistors have received much attention over the past few years. An important problem of these structures is the high levels of structural defects, mostly dislocations, due to the lack of a suitable lattice-matched substrate. So far, the substrate of choice has been mainly sapphire (Al_2O_3) substrates, which has a large lattice mismatch with GaN or AlN. As a result, (0001) GaN layers epitaxially grown on sapphire subtrates include high concentrations of misfit and threading dislocations. In this study, epitaxial GaN layers have been grown on patterned sapphire substrates by using an MOCVD system and high resolution XRD scans are performed to investigate the effect of patterned sapphire substrates on the dislocation density.

Biography

I Altuntas is pursuing PhD from Cumhuriyet University, Physics Department. He is the researcher of Nanophotonics Research and Application Center, Department of Nanotechnology Engineering.

ialtnts@gmail.com

Alev Kizilbulut et al., Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

THE ROLE OF GROWTH TEMPERATURE, V/III RATIO AND CBR4 FLOW ON CARBON DOPED P-GAAS EPILAYERS

Alev Kizilbulut[1, 2], Mehmet ErkuS[1, 2], Nizam Muzafferoglu[1] and Sezai Elagoz[2]
[1]Optoelektronic Research and Application Center, ERMAKSAN, Turkey
[2]Nanophotonic Research and Application Center, Cumhuriyet University, Turkey

In recent years, Carbon (C) has attracted much attention for obtaining p type GaAs and AlGaAs because of its low diffusion coefficient, ability to be doped to high levels, absence of memory effect. Furthermore, it has widely used for optical and electronical devices such as vertical cavity surface emitting lasers (VCSELs), heterojunction bipolar transistors (HBTs) and edge emitting laser diode structures. High doping concentration of around ~10^{19}-10^{20} cm^{-3} is required for ohmic contact layers. However, degradation of surface morphology also occurs at high doping concentrations and some hillocks can be seen the wafer surface. In this study, we have grown carbon p-GaAs staircase structures by using vertical type MOCVD reactor at the growth pressure of 50 mbar for obtain high doping concentration with good surfaces. Arsine (AsH_3) and trimethylgallium (TMGa) were used as precursors for arsenic and gallium, respectively. Carbon tetra bromide (CBr_4) was used for p-type dopant precursor. We have investigated the effect of growth temperature, V/III ratio, CBr_4 flow to hole concentration of p-GaAs. Carrier concentration of p-GaAs staircase samples was performed by ECV measurements.

Biography

Alev Kizilbulut is PhD student at Cumhuriyet University in Solid State Physics. She is working at ERMAKSAN Optoelectronic R&D Center as a researcher. Her interests are the growth with MOCVD and structural, electrical and optical characterizations of semiconductor devices.

alev.kizilbulu@ermaksan.com.tr

EuroSciCon

EuroSciCon Joint Event on
Laser Optics & Photonics and Atomic & Plasma Science

July 16-17, 2018
Prague, Czech Republic

Maxim P Vetchinnikov et al., Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

LASER-ASSISTED PRECIPITATION OF METAL AND SEMICONDUCTOR NANOPARTICLES IN OXIDE GLASS

Maxim P Vetchinnikov, Alexey S Lipatiev, Georgiy Yu Shakhgildyan, Sergey V Lotarev, and Vladimir N Sigaev
Mendeleev University of Chemical Technology of Russia, Russia

Femtosecond laser processing of oxide glasses is a perspective way for the development of novel glass-based optical materials. Oxide glasses doped with metal or semiconductor nanoparticles are expected to be especially promising because their unique properties depending on nanoparticle size may be combined with their micromodification by ultrafast laser beam fabricating various 3D structures with controlled optical properties. Laser-irradiated areas of predetermined geometry containing metal or semiconductor nanoparticles in a single piece of glass pave the way to improve a lot of photonic devices, such as ultrafast optical switches, polarization converters, active channel waveguides and high-density optical memory. Here, we report about one-step space-selective precipitation of silver or cadmium sulphide nanoparticles by femtosecond laser pulses inside silicate and phosphate glasses. We demonstrate that femtosecond laser irradiation of such glasses induces ring-shaped coloured microdomains which are prone to luminescence, absorption and homogeneous birefringence. Structure, chemical composition and sizes of nanoparticles formed in laser-written domains were examined by Raman spectroscopy, transmission electron microscopy and energy-dispersive X-ray spectroscopy. Variation of dopant concentration and laser writing conditions (i.e. pulse repetition rate, number of pulses, pulse duration and energy) are established to provide an opportunity to control optical and luminescent properties of the laser-induced domains. Scenario of femtosecond laser-induced precipitation of silver and cadmium sulphide nanoparticles inside oxide glasses was proposed.

Biography

Maxim P Vetchinnikov is a postgraduate student at the Department of Glass and Glass-ceramics of Mendeleev University of Chemical Technology of Russia. Since 2014, he is an Engineer of the International Center of Laser Technology and P Sarkisov International Laboratory of functional glass-based materials. His field of scientific interests and the scope of his current PhD study are Investigation of Metal- and Semiconductor-Doped Glasses and Space-Selective Laser-Induced precipitation of Plasmonic Nanoparticles and Quantum Dots in glasses. Results of his research have been published in 4 papers in peer-reviewed journals and protected by one patent of Russia.

Vetchinnickov.maxim@yandex.ru

EuroSciCon

EuroSciCon Joint Event on

Laser Optics & Photonics and Atomic & Plasma Science

July 16-17, 2018
Prague, Czech Republic

Sergey S Fedotov et al., Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

ULTRAFAST LASER-INDUCED INSCRIPTION OF NANOGRATINGS IN ALKALI SILICATE GLASSES

Sergey S Fedotov, Sergey V Lotarev, Alexey S Lipatiev, Alyona I Kurina and Vladimir N Sigaev
Mendeleyev University of Chemical Technology of Russia, Russia

Nanogratings are birefringent nanoperiodical structures generated inside glasses by a series of femtosecond laser pulses at certain pulse energies under melting threshold. They attract much attention due to their birefringence which can be controlled by the writing femtosecond beam that provides applications for devices with patterned birefringence such as polarization converters and ultrastable multilevel data storage, whereas enhanced chemical activity of nanogratings is used for selective etching of microfluidic components. Nanogratings were first revealed and studied in silica glass and recently demonstrated in several multicomponent glasses but there is still poor information about mechanism of their inscription depending on glass composition. Recently, we have demonstrated an effect of laser-induced nanoperiodical redistribution of Na^+ cations accompanying nanograting inscription in sodium silicate glass by 10^6-10^7 pulses. Here, we report possibility of nanograting formation in a set of R_2O-$Si_0 2$ glasses (R = Li, Na, K). We show that nanogratings can be inscribed in alkali silicate glasses by the number of pulses below 10^4 (two orders of magnitude faster than demonstrated for sodium silicate glass earlier) only in the narrow pulse energy range, which is quite different from silica glass. Surprisingly, though nanograting formation is possible at higher pulse energy, it takes much more pulses than in optimal pulse energy range. This effect is presumably attributed to the laser-induced chemical shift towards to lower alkali content and higher melting point, which takes place under a large number of laser pulses and allows formation of a nanograting instead of melting at a given pulse energy. Micro- and nanoscale chemical redistribution opens an opportunity of precision control of physical and chemical properties of predetermined microregions in multicomponent glasses for applications in photonics and optofluidics.

Biography

Sergey Fedotov has completed his PhD from Mendeleev University of Chemical Technology of Russia. He is researcher in the International Centre of Laser Technology of Mendeleev University of Chemical Technology of Russia. He has published 8 papers in reputed journals.

sergey.fedotov.91@gmail.com

EuroSciCon

DAY 2

Scientific Tracks & Abstracts

EuroSciCon Joint Event on

Laser Optics & Photonics and Atomic & Plasma Science

July 16-17, 2018 Prague, Czech Republic

DAY 2

July 17, 2018

Sessions

Session: Laser Systems | Photonic Systems | Optical Medium | Optical Interferometers | Nanophotonics and Biophotonics | Plasma Science | Organic Photonics | Organic Lasers

Session Chair	Session Co-Chair
Vijayan Asari University of Dayton, USA	O'Dae Kwon (POSTECH), South Korea

Session Introduction

Title: Nano scales tilt measurement using a cyclic interferometer: New developments
Charles Joenathan, Rose-Hulman Institute of Technology, USA

Title: Physicochemical, spectral-luminescent and lasing properties of Yb-containing huntite-like glass
Georgii Malashkevich, B.I. Stepanov Institute of Physics, Belarus

Title: Modeling of fast discharges in high-pressure gases
George V. Naidis, Joint Institute for High Temperatures RAS, Russia

Title: Input of Raman, SERS and Fluorescence Spectroscopy to Nanomedicine Research
Igor Chourpa, University of Tours, France

Title: Overcooled gas flow assisted quantum computing
Konstantin Lyakhov, Institute for Nuclear Science and Technology, South Korea

Title: A single electrode plasma discharge tube device
Shouguo Wang, Qilu University of Technology, China

Title: Pulsed MOVPE growth of high quality AlGaN epilayers for ultraviolet LED applications
Ilkay Demir, Cumhuriyet University, Turkey

Title: Optimization of Entangled Photon Pair Sources
Kadir Durak, Ozyegin University, Turkey

Title: A density functional method for quantum confinement in atomic systems
Amlan K. Roy, Indian Institute of Science Education and Research, India

Title: Evaluation of the residual stresses in wear protection coatings using X-Ray diffraction, ultrasonic and finite element technique
Adel K. Mahmoud, University of Diyala, Iraq

EuroSciCon

EuroSciCon Joint Event on
Laser Optics & Photonics and Atomic & Plasma Science

July 16-17, 2018
Prague, Czech Republic

C Joenathan et al., Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

NANO SCALES TILT MEASUREMENT USING A CYCLIC INTERFEROMETER: NEW DEVELOPMENTS

C Joenathan[1], A Bernal[1], Kashmira Tayabaly[2], Joseph Porter[1], Mourad Idir[2] and Lei Huang[2]

[1]Rose-Hulman Institute of Technology, USA
[2]Brookhaven National Laboratory, USA

Measurement of tilt or roll angle with high accuracy is required for a variety of engineering and scientific applications. A cyclic interferometer was shown to be more suitable than and twice as sensitive as conventional two beam interferometers for such measurements. Incorporating the idea of multiple reflections along with polarization phase step tilts in the order of 0.2 nano-radians were measured with a four phase step method. This interferometer, unlike conventional interferometers, has been shown to be insensitive to external vibrations. This stability was tested using extended time-scale measurements of tilt. Results show that the interferometer has good stability for measurements over time. We also show in this paper that spatial phase step routine with an unknown phase step can be used to determine tilts of a few nano-radians. In this technique, the phase map can be extracted and thus the tilt using only a single fringe pattern unlike the four phase step method. Further, we will discuss the concept of developing a compact cyclic interferometer to be used to calibrate an autocollimator for mirror shape metrology.

Biography

C Joenathan received his PhD in the area of Optics from IIT Madras in 1986. Presently, he is a Professor of Physics and Optical Engineering at Rose-Hulman Institute of Technology, USA. He was previously the Department Head of the Physics and Optical Engineering for 16 years. He is a fellow of OSA, OSI, and SPIE. He has published over 120 refereed articles in the field of Holography and Speckle Applications, HOE, and ESPI. He was instrumental in getting optical engineering program to be part of ABET. He is the Associate Editor for *Optical Engineering.*

Charles.joenathan@rose-hulman.edu

Georgii E Malashkevich et al., Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

PHYSICOCHEMICAL, SPECTRAL-LUMINESCENT AND LASING PROPERTIES OF YB-CONTAINING HUNTITE-LIKE GLASS

Georgii E Malashkevich[1], Viktoryia V Kouhar[1], Alexander A Sukhodola[1], Eugeny V Ivakin[1], Efim V Pestryakov[2], Viktor V Petrov[2], Vladimir N Sigaev[3], Nikita V Golubev[3], Marijam Z Ziyatdinova[3]

[1]B I Stepanov Institute of Physics, NASB, Republic of Belarus
[2]Institute of Laser Physics, SB RAS, Russia
[3]D I Mendeleev University of Chemical Technology, Russia

The glasses of the $(Yb_xY_{1-x})_2O_3$-Al_2O_3-B_2O_3 with composition close to the huntite stoichiometry was synthesized and their multi-aspect investigation was carried out. It was established that the glasses are characterized by (1) low efficiencies of cooperative luminescence of Yb-Yb pairs and photo bleaching and photo darkening caused by charge exchange of the activator ions as well as by high threshold of laser-induced destruction of the glass surface; (2) the $^2F_{5/2}$ --> $^2F_{7/2}$ luminescence band effective width and its limiting quantum yield consist of about 33 nm and 94% respectively; (3) heat conductivity increases from 0.6 to 0.9 W/mK with rise of Yb_2O_3 concentration from 0.5 to 10 mol. % and may grow up to 1.3W/mK at additional doping with Sb; (4) the nonlinear index of refraction close to 2.2×10^{-13} esu. These glasses lasing parameters at the both free-running mode and Q-switched operation were studied and obtained results were compared with the similar parameters of known glasses activated with Yb^{3+} ions.

Biography

Georgii Malashkevich defended his PhD degree in Physics and Mathematics in 1978 from the Institute of Physics of the BSSR Academy of Sciences and the Doctor of Science degree in Physics and Mathematics in 2003 from the Institute of Molecular and Atomic Physics of the NAS of Belarus. He is the Head of the A N Sevchenko Laboratory of Photophysics of Activated Materials, B I Stepanov Institute of Physics of the NAS of Belarus. He has published more than 80 papers in reputed journals and about 100 patents on invention of Belarus, Russia and the former USSR, as well as he is a member of the Advisory Editorial Board of the *J Appl Spectros*.

g.malashkevich@ifanbel.bas-net.by

EuroSciCon

EuroSciCon Joint Event on

Laser Optics & Photonics and Atomic & Plasma Science

July 16-17, 2018
Prague, Czech Republic

George V Naidis et al., Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-001

MODELING OF FAST DISCHARGES IN HIGH-PRESSURE GASES

George V Naidis and Natalia Yu Babaeva

Joint Institute for High Temperatures RAS, Russia

Pulsed discharges in high-pressure gases are of considerable interest as sources of non-equilibrium plasma for various technological applications: pollution control, pumping of laser media, plasma assisted combustion, etc. Discharge development in gap configurations with non-uniform distributions of electric field, such as point-plane or point-point gaps, typically proceeds via the prebreakdown stage of formation near the stressed electrode and propagation of ionization waves – streamers inside the gap. In conditions when the steepness of applied voltage front is not high, streamers are formed nearly at inception voltages, as thin plasma filaments. The growth of front steepness supplies conditions when streamer formation occurs at strong overvoltages, resulting in generation of wide plasma channels. Such produced plasma structures, similar to glow discharges, are of special interest to applications due to quasi-uniformity of plasma parameters in relatively large gas volumes. The specific features of fast ionization waves, besides large discharge width, are very high propagation velocities, approaching the speed of light and large currents, up to several hundred Amps. In this report, recent results of computational study of fast (subnanosecond) discharge formation are reviewed. On the basis of comparison of simulation results and experimental data the effects of various factors (voltage rise time, polarity, geometry of discharge gap, etc.) on discharge characteristics are revealed. The major physical phenomena governing the properties of fast discharges are analyzed.

Biography

George V Naidis is Principal researcher at the Joint Institute for High Temperatures of the Russian Academy of Sciences. He received his BS degree in Physics from the Moscow State University in 1969, and the CSc (PhD) and Doctor of Science degrees in Plasma Physics and Chemistry from the Joint Institute for High Temperatures in 1977 and 1993, respectively. His research interests include Physical and Chemical Kinetics of Low-Temperature Plasma, Physics Of Gas Discharges, Plasma Medicine. He has published about 130 refereed journal papers and reviews.

gnaidis@mail.ru

Igor Chourpa et al., Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

INPUT OF RAMAN, SERS AND FLUORESCENCE SPECTROSCOPY TO NANOMEDICINE RESEARCH

Igor Chourpa[1], Lynda Miloudi[1], Franck Bonnier[1], Katel Herve-Aubert[1], Mathias Pacaud[1,2], Emilie Allard-Vannier[1], Emilie Munnier[1], Anastasia Ignatova[3], Amir Fahmi[2] and Alexey Feofanov[3,4]

[1]University of Tours, Tours, France
[2]Rhein-Waal University of Applied Sciences, Germany
[3]Shemyakin-Ovchinnikov IBCh RAS, Russia
[4]Lomonosov Moscow State University, Russia

Research in nanomedicine is known to be a stimulating field for fruitful interaction between complementary scientific expertises. Indeed, it integrates the most recent advances in material chemistry, medicinal chemistry, physiology, biotechnology and biophysics. In the present talk, we will describe how the nanomedicine research can take benefit from the advanced molecular optical spectroscopy and spectral imaging. Conventional Raman and Surface-Enhanced Raman Scattering (SERS) are analytical techniques attracting a close attention due to several advantages they offer, namely direct analysis of many complex samples, with high spatial resolution and high molecular specificity, at relatively low cost. In case of SERS and fluorescence, increased selectivity and sensitivity are additional advantages. Furthermore, as we demonstrate, it is possible to combine SERS with fluorescence, either in a frame of a complementary analysis or via the simultaneous co-detection of both scattered and emitted photons. Such a combination/coupling allows, for instance, a more relevant interpretation of the molecular state and environment of active ingredients or of nanomedicine platforms in cells and tissues. Nevertheless, spectroscopic analysis of biological samples leads to collection of complex datasets often subjected to strong variations. It is particularly the case for spectral imaging, with thousands of spectra recorded when mapping the region of interest. For a more efficient mining of spectroscopic data, chemometric approaches are necessary. The input of our advanced spectroscopic approaches to nanomedicine research will be illustrated using their applications to bioanalytics (study of active molecules in pharmaceutic/cosmetic nanoforms and in biological cells and tissues) as well to diagnostics (development of novel nanoprobes for multimodal biomedical imaging of cancers). As we show, this input is not limited to characterize/evaluate nanomedicine forms, but it is extended to create novel spectroscopy-based diagnostic approaches, expected to be more specific, sensitive and reliable.

Recent Publications

1. Gautier J, Allard-Vannier E, Munnier E, Souce M and Chourpa I (2013) Recent advances in theranostic nanocarriers of doxorubicin based on iron oxide and gold nanoparticles. J Control Release 10;169 (1-2):48-61.
2. Gautier J, Allard-Vannier E, Burlaud-Gaillard J, Domenech J and Chourpa I (2015) Efficacy and Hemotoxicity of Stealth Doxorubicin-Loaded Magnetic Nanovectors on Breast Cancer Xenografts. J Biomed Nanotechnol 11(1):177-89.

Biography

Igor Chourpa has completed his PhD from the University of Reims, France in 1996. He joined the University of Tours in 1997. He is the Director of Nanomedicine and Nanoprobes laboratory (EA6295). This interdisciplinary team develops bio-analytical methods and nanomedicine technology for drug delivery and disease diagnostics. His specialization is in Molecular Optical Spectroscopy (Raman, SERS, fluorescence and IR) and Spectral Imaging. He has published more than 60 papers in reputed journals and 2 book chapters. He has experience in coordination of national and international research projects and has been acted as expert for numerous calls. He is an Editorial Board Member of *Journal of Analytical Methods in Chemistry*.

igor.chourpa@univ-tours.fr

EuroSciCon

EuroSciCon Joint Event on
Laser Optics & Photonics and Atomic & Plasma Science

July 16-17, 2018
Prague, Czech Republic

Konstantin A Lyakhov et al., Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

OVERCOOLED GAS FLOW ASSISTED QUANTUM COMPUTING

Konstantin A Lyakhov[1], A N Pechen[2] and H-J Lee[1]

[1]Institute for Nuclear Science and Technology, Jeju National University, South Korea
[2]Laboratory of Mathematical Methods for Quantum Technologies of Steklov Mathematical Institute, Russia

This paper is addressed to possibility of implementation of quantum computations by resonant excitation of target isotopologues in the gas flow. Population of quantum states of selectively excited isotopologues can be manipulated by the sequence of laser pulses. For optimal control of excitation laser pulses should be specifically shaped. Moreover, their periodicity also plays essential role. Supersonic overcooled gas flow is the best to use as a quantum Turing machine, because molecular spectra are well resolved and, therefore, better control over them by laser field can be implemented. Decoherence level in ensemble of molecules and clusters, representing gas flow, can be controlled by its rarefaction degree and extension. Evolution of quantum states population is guided by the battery of femtosecond lasers installed along the gas flow direction. Each laser emits laser pulse of predesigned shape, which is related to some command written for the quantum computer (unitary transformation). The quantum state in the end of gas flow is the result of calculation. If gas flow transition time is not long enough to complete all sequence of required commands, received final state (intermediate solution) is recorded and translated into laser pulse shape, assigned for initialization. Otherwise, initialization laser pulse is step-like with intensity just high enough to excite all isotopologues to the same quantum state. Final quantum state of the gas flow is read by the classical computer by finalizing measurement, which is implemented as following: Once irradiated gas flow feeds spectrometer, where electrons, corresponding to resulting quantum state, are ejected by applied ionizing laser pulse. Obtained electron energy spectra, bearing information of original optical spectrum, are recorded by the network of surrounding electrodes, and then amplified. By analog-digital convertor electrical currents induced on electrodes are transformed into digital format for further processing on the classical computer.

Biography

Konstantin Lyakhov has completed his PhD in Theoretical Physics in J W Goethe University in 2008. Since 2008, he has been an Oil Reservoir Engineer in Petroleum Technologies. In early 2010, he became a researcher in Institute of Biochemical Physics of Russian Academy of Science. In late 2010, he joined the Plasma Applications Laboratory, Nuclear and Energy Engineering Department of Jeju National University, as a researcher, and from 2012 as a Research Professor. He has published 12 papers in SCI journals (in 10 of them as a first author, total number of co-authors is no more than 2).

lyakhov2000@yahoo.com

EuroSciCon

EuroSciCon Joint Event on
Laser Optics & Photonics and Atomic & Plasma Science

July 16-17, 2018
Prague, Czech Republic

Shouguo Wang, Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

A SINGLE ELECTRODE PLASMA DISCHARGE TUBE DEVICE

Shouguo Wang
Qilu University of Technology, China

A discharge tube device has a replaceable discharge tube and a hand-held shell into which the replaceable discharge tube is plugged. There is a single electrode inside of the tube and no other electrodes outside. This electrode is connected to an output of a power supply and another output of the power supply is connected to the ground .The input of the power supply is a 12V or lower, DC (direct current) source, or a battery. The plasma is generated via a contact-tube outside discharge, or a plasma jet from the tube, that uses working inert gas. The plasma discharge tube will produce atmospheric pressure, cold quasi-glow plasma, which can be used for sensitive surface disinfection, sterilization, as well as facial skin rejuvenation, treatment of skin tissue infections and destruction of cancer cells.

Biography

Shouguo Wang is the Director of Cross Institute of Science, Qilu University of Technology, China. He has completed his PhD in June 1997, from Institute of Plasma Physics, CAS. He worked as Professor in Institute of Optoelectronics (2003-2008), Microelectronic Institute (2008-2013) and Institute of Plasma Physics (2013-2017) respectively. He was a Visiting Scholar in Institute of Laser and Plasma Physics (2000-03). His research areas include Plasma medicine, power supply, DBD, PECVD, Plasma boost, Plasma applications.

wangshouguo@aoe.ac.cn

I Demir et al., Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

PULSED MOVPE GROWTH OF HIGH QUALITY ALGAN EPILAYERS FOR ULTRAVIOLET LED APPLICATIONS

I Demir[1], Ryan McClintock[2], Y Kocak[3], I Altuntas[1], A Emre Kasapoglu, E Gur[3], S Elagoz[1] and M Razeghi[2]
[1]Cumhuriyet University, Turkey
[2]Northwestern University, USA
[3]Ataturk University, Turkey

III-nitride based semiconductor materials have attracted interest since they have excellent physical, electrical, and optical properties, and their high chemical and thermal stability as compared to traditional III-V semiconductors. The UV capabilities of III-nitride based semiconductor materials have special attraction for civilian applications such as air and water sterilization, efficient white lighting, high density optical data storage and military applications such as biological agent detection and non-line-of-sight communication etc. In last 10 years AlN and AlGaN have received a great deal of attention for use as a template layer for deep UV (DUV) emitter and detector applications because of their promising features such as UV transparency, good thermal stability and high thermal conductivity. Generally, the surface morphology and defect density of AlGaN and the upper quantum-well active layer of DUV devices depend significantly on the crystalline quality of the underlying AlN template; therefore, obtaining AlN with a smooth surface and low threading dislocation (TD) density is critical to improve DUV device performance. In this study we have investigated the effects of pulsed MOVPE growth of AlGaN epilayers on structural, morphological and optical properties.

Biography

Ilkay Demir has completed his PhD from Cumhuriyet University-Turkey. He spent a year during his PhD at Center for Quantum Devices-Northwestern University under the supervision of Prof. Manijeh Razeghi. He is working at Nanophotonics Research and Application Center, Cumhuriyet University as an Assistant Professor. He has published 12 papers in reputed journals and more than 40 proceedings at the international conferences. He has been awarded the Young Scientist Award at the European Materials Research Society (E-MRS) 2016 Spring Meeting in Lille, France.

idemir@cumhuriyet.edu.tr

Kadir Durak et al., Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

OPTIMIZATION OF ENTANGLED PHOTON PAIR SOURCES

Kadir Durak, Esra Malyer and Can Eraydın
Ozyegin University, Turkey

The spontaneous parametric down conversion (SPDC) process is widely used in the fields of nonlinear optics and quantum key distribution. The brightness, heralding efficiency and the fidelity are key parameters to be maximized in the SPDC sources. While the heralding efficiency is determined by the collection efficiency and the photon detection efficiencies (PDE) of the single photon detectors, the entanglement quality and brightness of the photon pairs created by spontaneous parametric down conversion process are effected by various parameters. The difference in the arrival times of the signal/idler pairs of two orthogonal polarizations reduces the fidelity of the states by introducing decoherence. Another parameter affecting the fidelity of the states is length tolerance of the nonlinear crystals. The decoherence in the setup can be compensated by the use of a very narrow linewidth pump laser. The limits of the trade-off between the crystal length tolerance and the laser line width have been identified for target entanglement fidelity values. The effect of different types of collection lenses has also been identified for enhancement of the heralding efficiency values. A full analysis of parameters for the optimization of SPDC sources is done via a set of numerical simulations. Further recommendations have also been included in this work for reaching very high brightness, heralding efficiency and entanglement fidelity values of the entangled photon pair sources.

Biography

Kadir Durak has received his BSc degree in Middle East Technical University Physics Department in 2009 and he started his PhD in National University of Singapore at the same year. After receiving PhD in 2015 he worked for two years in Centre for Quantum Technologies as Team Lead in a research group that works on space-ground quantum key distribution via a CubeSat. His main research areas are Quantum Cryptography, Photonics, Quantum Electrodynamics and Quantum Information. He is currently pursuing his Research in Ozyegin University with his research group.

kadir.durak@ozyegin.edu.tr

EuroSciCon

EuroSciCon Joint Event on
Laser Optics & Photonics and Atomic & Plasma Science

July 16-17, 2018
Prague, Czech Republic

Amlan K Roy et al., Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

A DENSITY FUNCTIONAL METHOD FOR QUANTUM CONFINEMENT IN ATOMIC SYSTEMS

Amlan K Roy and Sangita Majumdar
Indian Institute of Science Education and Research, India

Confinement of an atom inside an impenetrable cavity was first studied in fourth decade of twentieth century. Progress of research on such quantum systems was reviewed several times, recording their importance in both fundamental physics, chemistry and in various engineering branches. It causes substantial changes in the observable properties, such as energy spectrum, transition frequency, transition probability, polarizability, ionization potential, chemical reactivity etc. They have relevance in many different physical situations, e.g., atoms under plasma environment, impurities in crystal lattice and semiconductor materials, trapping of atoms/molecules in zeolite cages or inside an endohedral cobweb of fullerenes, quantum wells, quantum wires, quantum dots and so forth. Furthermore, such models were designed to mimic high pressure environment inside the core of planets. Also, they have contemporary significance in interpreting various astrophysical phenomena and other interesting areas. Density functional theory (DFT) has played a pivotal and unique role for realistic treatment of atoms, molecules, solids, clusters for three decades. Now, it is an indispensable tool for modern electronic structure calculations. The advantage lies in its ability to account for electron correlation effects in a transparent manner keeping the computational cost affordable. As spatial confinement introduces extensive changes in physical and chemical properties of the concerned systems, it is expected to provide a wealth of new information to uncover the physics behind such phenomena. This is a relatively young research area. We report the preliminary theoretical results on such confined atoms within the broad domain of Hohenberg-Kohn-Sham DFT. A non-variational work-function-based potential accounts for the exchange effects accurately, for both ground and excited states, whereas correlation effects are incorporated by employing a simple parametrized local Wigner functional. The non-relativistic KS equation is solved self-consistently by invoking a generalized pseudospectral (GPS) method. This offers a non-uniform optimal spatial grid discretization which provides accurate eigenvalues, wave functions, expectation values and radial densities. The exchange-only results are practically of Hartree-Fock quality and with correlation; these are comparable to some of the very sophisticated and elaborate (such as CI, MCHF) methods available. Obtained results are compared with existing literature data, wherever possible. Furthermore this is extended for information-theoretic measures like Fisher information, Renyi entropy, Tsallis entropy, Shannon entropy and Onicescu energy, in both position and momentum spaces, which may provide a detailed knowledge about diffusion of wave functions, spread of density, localization-delocalization of particle, etc. The momentum-space wave functions are obtained numerically from the Fourier transformation of respective position-space counterpart. A detailed systematic study of these information measures at various confining radius reveals many new interesting features. In essence, a DFT methodology has been presented for information measures in free and confined atoms.

Biography

Amlan K Roy completed his PhD in Theoretical Chemistry from Punjab University, in India. Later, he pursued his Post-doctoral Research at number of places in North America, such as University of New Brunswick (Fredericton, Canada), University of Kansas (Lawrence, USA), University of California (Los Angeles, USA), University of Florida (Quantum Theory Project). His primary research interest is to Develop Methods for Electronic Structure and Dynamics of Many-Electron Systems, within the Broad Domain of Density Functional Framework. Presently, he is an Associate Professor at IISER, Kolkata. He has published more than 65 research papers and book chapters in reputed journals. He has been serving as a Reviewer in several renowned journals. His biography has been included in 63rd edition of Marquis Who's Who in America, 2009. In 2012, he has edited a book entitled Theoretical and Computational Developments in Modern Density Functional Theory.

akroy6k@gmail.com,
akroy@iiserkol.ac.in

Adel K Mahmoud et al., Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

EVALUATION OF THE RESIDUAL STRESSES IN WEAR PROTECTION COATINGS USING X-RAY DIFFRACTION, ULTRASONIC AND FINITE ELEMENT TECHNIQUE

Adel K Mahmoud[1], Zaid S Hammodi[2] and Samah R Hassan[1]
[1]University of Diyala, Iraq
[2]University of Technology, Iraq

This paper is presented an overview of the evaluation techniques of residual stresses in wear protection coatings. The main experimental techniques for measurement of residual stresses are briefly described, with particular attention given to the methods of X-Ray diffraction, ultrasonic and finite element techniques. Boundary conditions satisfied by all residual stresses distribution are identified and expressions derived for the X-Ray diffraction, ultrasonic and stress distributions arising from a uniform misfit strain between wear protection coating and substrate. It is noted that stress distribution in thick wear protection coatings rarely correspond to the imposition of such a numerical method becomes essential for quantitative prediction of residual stresses values and stress distributions. Relationships are presented between residual stresses and corresponding strain energy release rates during interfacial debonding. The effect on this of superimposing stresses from an externally applied load is outlined. The initiation of debonding is then considered, covering edge effects and other geometrical consideration. Finally, some specific case histories are briefly outlined to illustrate how the various theoretical and experimental concepts involved relate to industrial practice and applications.

Biography

Adel K Mahmoud has completed his PhD from University of Technology, Baghdad, Iraq and was awarded Professor Degree in 2015 from University of Diyala. He is a Visiting Professor currently in Ankara Yildirim Beyzit University, Ankara, Turkey. He has published more than 30 papers in reputed journals and has been serving as an Editorial Board Member of repute.

adel_alkayali@yahoo.com

EuroSciCon

VIDEO PRESENTATION
Abstracts

EuroSciCon Joint Event on

Laser Optics & Photonics and Atomic & Plasma Science

July 16-17, 2018 Prague, Czech Republic

Oara Neumann et al., Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

FLUORESCENT AND T1 MRI ACTIVE MULTILAYER NANOPARTICLE FOR IMAGING AND TARGETING CELLULAR DELIVERY

Oara Neumann[1], Luke Henderson[1], Caterina Kaffes[2], Runmin Zhang[1], Valeria S Marangoni[1], James Bankson[2], Peter Nordlander[1] and Naomi J Halas[1]
[1]Rice University, United States
[2]The University of Texas-M D Anderson Cancer Center, United States

Multifunctional plasmonic nanostructures have enormous potential in the treatment of solid tumors; however, tracking particles with drug cargo and triggering the release of the cargo in mapped tumors is still impossible. To overcome this challenge we have developed an MRI and fluorescent active nanostructure nanomatryoshka. This new nanostructure with IR plasmonic signatures is composed of a 50 nm Au core surrounded by dye molecules and Gd(III)-DOTA chelate doped SiO_2 inner-shell and an outer Au shell. The experimental results demonstrates an enhanced T_1 relaxation (r_1~24 $mM^{-1}s^{-1}$ at 4.7T) compared to the clinical Gd(III)-DOTA chelating agents (r1~4 $mM^{-1}s^{-1}$). Further, this design preserves the fluorescence signal (65%) after 24 hours of exposure, leading to enahanced fluorescence photostability (23x). This dual-imaging functionality nanosystem increases MRI sensitivity by concentrating Gd(III) ions into the Gd-NMs, reduces the potential toxicity of Gd(III) ions and dye molecules by preventing their release in vivo through the outer Au shell protection, and the terminal gold layer surface can then be functionalized to increase cellular uptake, circulation time, or thermal drug-release properties.

Biography

Oara Neumann has completed her PhD and Postdoctoral study in Applied Physics at Rice University and MS from Weizmann Institute of Science, Israel and Bucharest University, Romania. She is a Research Scientist in Naomi Halas group at Rice University. She holds 12 patents and she has published more than 25 papers in reputed journals.

Oara.Neumann@rice.edu

EuroSciCon

EuroSciCon Joint Event on

Laser Optics & Photonics and Atomic & Plasma Science

July 16-17, 2018
Prague, Czech Republic

T Fulton Johns, Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-002

COSMIC DARK MATTER FRACTAL FIELD THEORY

T Fulton Johns
University of Tennessee Health Sciences, USA

The CDMFF theory presented in the book The Great Cosmic Sea will explain how the evolution of our planet and its biosphere is actively evolving with our cosmos through a complex network of powerful morphogenetic fields at all scales. This theory explains many of the findings revealed by scientific evidence of the nature of the fabric of our cosmic sea in which we coexist with each other and other worlds, both terrestrial and extra-terrestrial. Our reality is indeed illusory when taken into full context as a part of an expanse that sits almost exactly in the middle of a scalar continuum from the Planck scale to the vast visible universe and the super-massive objects known to exist there. Even more illusory when we consider that all of the matter we perceive through scientific inspection and even our individual sensory perceptions make up only 4% of our entire cosmos. The presence of dark matter and dark energy accounting for the other 96% leaves quite a void in our pretence to understand the cosmos. However, there are significant clues that lead to clarity when the body of scientific research is considered across multiple disciplines. That is what I have done for most of my professional years as a perpetual student of the sciences and have discovered a common thread that encompasses all forces of nature including the neglected life force. So it is not as an authority on any one subject that I bring this theory forward for your consideration but as a student who has uncovered a concept that keeps answering questions I have pondered for decades.

Biography

T Fulton Johns is General Dental Implant Surgery for 25 years after graduation from the University of Tennessee Health Sciences in 1978. He has his expertise in General Dentistry from the past 15 years and in Private practice at Knoxville, Tennessee. He is Perpetual student of science all of his life.

tfjohns@gmail.com