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Eighth Conference on Optics

Valentin I. Vlad
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Introduction

The conference on Micro- to Nano-Photonics: ROMOPTO 2006 is the eighth in a series of international conferences dedicated to optics and photonics, held every three years in Romania and initiated by Acad. Prof. Ioan Ursu. The topics of this conference are related to the modern micro- and nano-photonics and reflect the fast evolution of optics and its applications in material science, information science and technology, optoelectronics, biology and medicine, and sensing and metrology. The results in these fields demonstrate the important role of photonics in the progress of the modern society.

The purpose of ROMOPTO 2006 was to provide an opportunity for the optics scientists to share experiences, discuss their newest results, stimulate interdisciplinary research, and consider the perspective of applications. The position of our country, Romania, in the Central-East Europe plays an important role in the promotion of the scientific contacts in this region. We are now integrating into the European Union, NATO, and are actively participating in the EU-R&D Programmes. In the national strategy in R&D, photonics plays an important role both in basic research and in technological platforms. I can add the fact that Sibiu, the host town of the conference, and Luxembourg are European capitals of culture in 2007.

The organization of ROMOPTO 2006 was possible only by the actions and support of several national and international institutions. We have to mention and thank the Romanian Academy, the Romanian Ministry of Education and Research, the Division of Optics and Quantum Electronics of the Romanian Physical Society (which is a Territorial Committee of ICO and EOS), the Romanian Chapter of SPIE, the Institute of Atomic Physics, the National Institute of Laser, Plasma and Radiation Physics (NILPRP), the University "Lucian Blaga" of Sibiu, the National Institute of Optoelectronics (NIOE 2000) and the University of Bucharest.

Thanks are due to the cosponsoring institutions of this conference: European Network of Excellence "Nanophotonics to Realise Molecular Scale Technologies" (PHOREMOST), SPIE Europe, the "Abdus Salam" International Centre for Theoretical Physics (ICTP, Trieste, Italy), ICO—International Commission for Optics, OSA—Optical Society of America, EOS—European Optical Society, and the United States Air Force—European Office of Aerospace Research and Development (EOARD). Particularly, I express my entire gratitude to Prof. Clivia Sotomayor-Torres and Prof. E. Ozbay (PHOREMOST), Prof. J. Bilbro and Dr. E. Arthurs (SPIE), Prof. A. Friberg, Prof. G. von Bally, Prof. Maria Calvo and Prof. A. Friesem (ICO), Prof. K.R. Sreenivasan and Prof. Gallieno Denardo (ICTP) for their important support to the conference ROMOPTO 2006 and to our optics community.

By the efforts of the scientific advisory committee, coordinated by Prof. M. Bertolotti and the programme committee, about 170 scientific papers by authors from 19 countries have been selected for presentation at ROMOPTO 2006, in seven plenary lectures, 36 invited lectures, 52 oral presentations and 76 posters. I express my entire gratitude to the members of these committees, referees, to the invited professors, and to all participants for their high level work. Some of these papers, reviewed by an international referee board, are published in this SPIE Proceedings volume, which hopefully will have a wide distribution and a large interest in the scientific world.

The joy of meeting so many friends at ROMOPTO 2006 was shadowed by the passing from this world of one of the strongest supporters of this conference, Professor Herbert Walther, director and founder of MPQ, Garching, at the end of July. He was an outstanding researcher of the physics of light, an exceptional man and friend, an honored member of the Romanian Academy, and a member of the editorial board of *Romanian Reports in Physics*. Prof. N. Kroo evocated Herbert's personality in his plenary talk. Shortly after Easter 2007, Acad. Ioan Ursu, one of the most preeminent Romanian physicists and the initiator of ROMOPTO conferences, passed also from this world. Requiescant in Pace!

I would like to express my thanks to the members of the international scientific advisory committee, programme committee, and organizing committees of ROMOPTO 2006 for their hard work. My gratitude is specially conveyed to Prof. C. Oprean, rector of the University "L. Blaga" of Sibiu, Prof. G. Sofonea, dean of faculty of engineering at "H. Oberth," Prof. I. Isarie, former rector, and to the local organizing team: Prof. V. Petrescu, Prof. Toderita Nemes, Prof. Cl. Isarie, and Mr. V. Fagarasan (University Protocol), all of whom were superb hosts of this conference. Special address and thanks go Dr. R. Medianu, the general director of NILPRP, Dr. Clementina Timus, coordinator of the organizing committee (for her efforts in disseminating information and paper collection), Dr. Adrian Petris (for the important efforts in all steps of conference organization), Dr. Mircea Udrea (for sponsorisations of Coherent Inc. and Apel Laser), and to Doina Nicolae and Camelia Talianu (for design and management of the conference web site), and to my students, Petronela Doia, Tatiana Bazaru, I. Dancus, Alexandra Olteanu, and Mariana Buzatu, for their hard work and efforts in support of this conference.

Finally, I hope that the participants in ROMOPTO 2006 enjoyed the scientific sessions, met their friends in Sibiu, and had the opportunity to start new scientific collaborations. Hopefully also, they will remember their visit in Romania, in the Transylvanian county.

Valentin I. Vlad

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ICTP—The "Abdus Salam" International Centre for Theoretical Physics

ICO—International Commission for Optics

EOS—European Optical Society (EOS)

Institute of Atomic Physics (Romania)

New Optical Components Based on Nano-scale Features

M. J. Soileau

Distinguished Professor of Optics, ECE, and Physics and Vice President for Research, University of Central Florida, Orlando, USA

ABSTRACT

In this talk I will review the research at the College of Optics and Photonics/CREOL, which has led to novel approaches in nanophotonics and which is impacting laser devices and applications.

One of the technologies to be reviewed is based on nano-scale features in photo-thermal-refractive (PTR) glass. PTR glass allows for the production of distributed nano-crystals in the bulk of highly transparent optical glass. These 3-D patterns are holographically produced. Among the applications demonstrated are bulk diffraction gratings, which are highly dispersive, cavity mirrors for extreme wavelength selectivity and stability, beam sampling optics, beam sharing optics, and optics which combine imagery and wavelength selectivity.

The PTR elements produced have the additional properties of high laser damage threshold and environmental stability. Manufacturing processes, optical and mechanical properties, and specific results from various applications will be presented.

Semiconductor pumped cw solid-state lasers in the visible and UV spectral region

Guenter Huber

Institut für Laser-Physik, Universität Hamburg, Germany

ABSTRACT

Intracavity frequency conversion of near IR solid-state lasers efficiently yields coherent visible radiation. Furthermore, semiconductor pumped Er-, Yb, Pr- up-conversion lasers and direct pumped Pr- lasers operate on fundamental visible modes offering simple and efficient nonlinear UV-generation.

Inorganic nanotubes and inorganic fullerene-like materials: state of the art (from concept to applications)

Reshef Tenne

Department of Materials and Interfaces, Weizmann Institute, Israel

ABSTRACT

We have proposed in 1992 that nanoparticles of layered compounds will be unstable against folding and close into fullerene-like structures and nanotubes (*IF*). Initially this hypothesis was realized in WS_2, MoS_2 and the respective diselenides. Subsequently, nanotubes and fullerene-like structures were prepared from numerous compounds with layered and recently also non-layered structure by various groups. Much progress has been achieved in the synthesis of inorganic nanotubes and fullerene-like nanoparticles of WS_2 and MoS_2 and many other metal dichalcogenides over the last few years. Synthetic methods for the production of multiwall WS_2 nanotubes by sulfidizing WO_3 nanoparticles have been described and further progress is underway. A fluidized-bed reactor for the synthesis of up to 100 g/day of fullerene-like WS_2 nanoparticles has been established in our lab, and the scaling-up of the synthesis to 100 kg/day and beyond is under way. The detailed mechanisms for the synthesis of fullerene-like WS_2 and MoS_2 nanoparticles and nanotubes of these compounds have been elucidated.

Substantial progress has been accomplished in the use of such nanoparticles for tribological applications and lately for e.g. impact resilient materials for self-protection. Numerous testing programs have been undertaken jointly with different laboratories and major industrial partners and have clearly indicated the usefulness of the fullerene-like WS_2 (MoS_2) as solid lubricants in various products. These tests indicated that *IF*-MoS_2 and *IF*-WS_2 are heading for large scale applications in the automotive, machining, aerospace, electronics, medical and numerous other kinds of industries. This technology was licensed to "ApNano Materials, Inc." ("NanoMaterials, Ltd."), which is currently involved in many collaborative development programs. Novel applications of inorganic nanotubes and fullerene-like nanoparticles in the fields of catalysis; microelectronics; Li rechargeable batteries; medical and opto-electronics will be presented.

Advances in mapping and steering of functional organic molecules by nonlinear optics from micron to single molecule scale

Joseph Zyss*, Gabriel Dutier, Sophie Brasselet

Molecular Quantum Photonics Laboratory and d'Alembert Institute, Ecole Normale Supérieure Cachan, France

ABSTRACT

We will report all the way from principles to latest advances, of a new approach to molecular nonlinear optics whereby nonlinear light-molecule interactions are used to encode information in molecular matter, rather than simply probe the nonlinear behaviour of molecular systems. This approach is based on the recognition of the angular dependence of generalized multiphoton interaction selection rules, by virtue of which specific sub-set of molecules in a priori random organization can be selectively addressed. Demonstrations on various molecular systems and states of matter (crystal, polymers with various degrees of orders) at micron and nanoscales will be emphasized.