

PROCEEDINGS OF SPIE

Sixth International Conference on

Advanced Optical Materials and Devices (AOMD-6)

Janis Spigulis
Andris Krumins
Donats Millers
Andris Sternberg
Inta Muzikante
Andris Ozols
Maris Ozolinsh
Editors

24–27 August 2008
Riga, Latvia

Co-organized by
Institute of Atomic Physics and Spectroscopy, University of Latvia
Institute of Solid State Physics, University of Latvia
International Society for Applied Optics, Latvia

Sponsored by
OSA—Optical Society of America (United States)
EOS—European Optical Society
University of Latvia
Latvian Council of Science (Latvia)

Cooperating Organization and Publisher
SPIE

Volume 7142

Proceedings of SPIE, 0277-786X, v. 7142

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:

Author(s), "Title of Paper," in *Sixth International Conference on Advanced Optical Materials and Devices (AOMD-6)*, edited by Janis Spigulis, Andris Krumins, Donats Millers, Andris Sternberg, Inta Muzikante, Andris Ozols, Maris Ozolinsh, Proceedings of SPIE Vol. 7142 (SPIE, Bellingham, WA, 2008) Article CID Number.

ISSN 0277-786X
ISBN 9780819473844

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA
Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445
SPIE.org

Copyright © 2008, Society of Photo-Optical Instrumentation Engineers

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/08/\$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.

SPIE 
Digital Library

SPIDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc.

The CID number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID number.

Contents

ix	<i>Conference Committees</i>
xi	<i>Sponsors and Supporters</i>
xiii	<i>Introduction</i>

SESSION 1 PLENARY PAPERS

- 7142 02 **Gas in scattering media absorption spectroscopy - GASMAS** [7142-52]
S. Svanberg, Lund Univ. (Sweden)
- 7142 03 **Yu. N. Denisyuk, E. Leith, and J. Upatnieks: founders of volume and laser holography**
[7142-25]
S. B. Gurevich, A.F. Ioffe Physical-Technical Institute (Russian Federation)
- 7142 04 **The concept of a unified modeling of optical radiation propagation in complex turbid media** [7142-57]
I. Meglinski, Cranfield Univ. (United Kingdom); M. Kirillin, Univ. of Oulu (Finland); V. L. Kuzmin, St. Petersburg Institute of Commerce and Economics (Russian Federation)
- 7142 05 **Characterizing semiconductor materials with terahertz radiation pulses** [7142-59]
A. Krotkus, R. Adomavičius, V. Pačebutas, Semiconductor Physics Institute (Lithuania)
- 7142 06 **Low-frequency excitation of double quantum dots** [7142-56]
V. Kashcheyevs, Univ. of Latvia (Latvia)
- 7142 07 **Laser structuring of conducting films on transparent substrates for electronics devices**
[7142-13]
G. Račiukaitis, Institute of Physics (Lithuania)

SESSION 2 INORGANIC OPTICAL MATERIALS

- 7142 08 **Visible light emission and control by infrared-responsive materials** [7142-10]
M. Saito, Y. Takahashi, K. Matsuda, Ryukoku Univ. (Japan); M. Yamazaki, N. Sawanobori, Sumita Optical Glass, Inc. (Japan)
- 7142 09 **Alkali-ion irradiated alpha-quartz: low-temperature cathodoluminescence after chemical epitaxy** [7142-02]
K. P. Lieb, S. Gąsiorek, Univ. Göttingen (Germany); J. Keinonen, Univ. Göttingen (Germany) and Univ. of Helsinki (Finland); P. K. Sahoo, Univ. Göttingen (Germany) T. Sajavaara, Univ. of Helsinki (Finland)

- 7142 0A **Nanostructure of glasses: experimental evidence** [7142-35]
L. V. Maksimov, A. V. Anan'ev, Research and Technological Institute of Optical Materials Science (Russian Federation); V. N. Bogdanov, St. Petersburg State Univ. (Russian Federation); A. A. Lipovskii, St. Petersburg State Polytechnical Univ. (Russian Federation); D. K. Tagantsev, Research and Technological Institute of Optical Materials Science (Russian Federation); O. V. Yanush, St. Petersburg State Technological Univ. of Plant Polymers (Russian Federation)
- 7142 0B **Vibrational and structural properties of unmodified and radiation-modified chalcogenide glasses for advanced optical applications** [7142-42]
T. Kavetsky, Scientific Research Co. Carat (Ukraine), Drohobych Ivan Franko State Pedagogical Univ. (Ukraine), and Jan Dlugosz Univ. (Poland); O. Shpotyuk, Scientific Research Co. Carat (Ukraine) and Jan Dlugosz Univ. (Poland); V. Balitska, Scientific Research Co. Carat (Ukraine); G. Dovbeshko, I. Blonsky, Institute of Physics (Ukraine); I. Kaban, W. Hoyer, Chemnitz Univ. of Technology (Germany); M. Iovu, A. Andriesh, Ctr. of Optoelectronics (Moldova)
- 7142 0C **Study of optical material anisotropy using scanning millimeter wave beam** [7142-41]
A. Laurinavičius, Semiconductor Physics Institute (Lithuania); V. Derkach, Usikov Institute of Radiophysics and Electronics of NAS of Ukraine (Ukraine); T. Anbinderis, Elmika Ltd. (Lithuania)
- 7142 0D **Second harmonic generation in selenium-metal structures** [7142-29]
I. Mihailova, V. Gerbreders, Daugavpils Univ. (Latvia); E. Sledevskis, Daugavpils Univ. (Latvia) and Univ. of Latvia (Latvia); V. Kolbjonoks, E. Tamanis, Daugavpils Univ. (Latvia)
- 7142 0E **Optical properties of hydrogen-containing MgO crystal** [7142-36]
V. Skvortsova, N. Mironova-Ulmane, L. Trinkler, L. Grigorjeva, Univ. of Latvia (Latvia)
- 7142 0F **Second harmonic generation in selenium thin films** [7142-26]
E. Sledevskis, Daugavpils Univ. (Latvia) and Univ. of Latvia (Latvia); Vj. Gerbreders, V. Kolbjonoks, J. Teteris, Daugavpils Univ. (Latvia); A. Gulbis, Riga Technical Univ. (Latvia)

SESSION 3 PHOTOVOLTAICS, THIN FILMS, AND SPECTROSCOPY

- 7142 0G **High repetition rate optical parametric oscillator based on a periodically poled lithium niobate crystal pumped by nanosecond Q-switched Nd:YVO₄ laser** [7142-34]
L. Petravičiūtė, O. Balachninaite, V. Sirutkaitis, Vilnius Univ. (Lithuania)
- 7142 0H **Noise characteristics and reliability of high power white light emitting diodes based on nitrides** [7142-54]
J. Matukas, V. Palenskis, J. Vyšniauskas, B. Šaulys, S. Pralgauskaitė, A. Pincevičius, Vilnius Univ. (Lithuania)
- 7142 0I **Fiber-optic biosensor based on self-mixing interferometry** [7142-09]
M. Mänttälä, J. Lauri, M. Kinnunen, Univ. of Oulu (Finland); J. Hast, VTT Technical Research Ctr. of Finland (Finland); R. Myllylä, Univ. of Oulu (Finland)
- 7142 0J **Deconvolution of the mercury 253.7 nm spectral line shape for the use in absorption spectroscopy** [7142-24]
N. Zorina, G. Revalde, Univ. of Latvia (Latvia); R. Disch, Sieck Maihak GmbH (Germany)

- 7142 OK **TiO₂-PHT interface influence to charge carrier photo generation and recombination** [7142-33]
G. Sliaužys, G. Juška, K. Genevičius, Vilnius Univ. (Lithuania); J. H. Smått, M. Lindén, R. Österbacka, Åbo Akademi Univ. (Finland)

SESSION 4 OPTICAL SEMICONDUCTOR MATERIALS

- 7142 OL **Mid-infrared photoluminescence of PbSe film structures up to room temperature** [7142-06]
Z. Dashevsky, V. Kasiyan, G. Radovsky, E. Shufer, M. Auslender, Ben-Gurion Univ. (Israel)
- 7142 OM **Formation of SiC - like layers on Si surface in contact with C₆H₅CH₃ solution by UV laser irradiation** [7142-22]
M. Yusupov, L. Fedorenko, O. Lytvyn, V. Yukhimchuk, V. Lashkaryov Institute of Semiconductor Physics (Ukraine)
- 7142 ON **GaAs/AlGaAs heterojunction as a fast detector of infrared laser pulses** [7142-46]
S. Ašmontas, J. Gradauskas, V. Kazlauskaitė, A. Sužiedėlis, E. Širmulis, M. Vingelis, Semiconductor Physics Institute (Lithuania)
- 7142 OO **Evaluation of deep trap compensation ratio and recombination parameters by transient grating techniques** [7142-31]
A. Kadys, K. Jarašiūnas, Vilnius Univ. (Lithuania); Ph. Delaye, Lab. Charles Fabry de l'Institut d'Optique, CNRS, Univ. Paris-Sud (France); D. Verstraeten, Univ. de Liège (Belgium)
- 7142 OP **Formation of deep acceptor centers in AlGaIn alloys** [7142-58]
L. Dimitrocenko, J. Grube, P. Kulis, G. Marcins, B. Polyakov, A. Sarakovskis, M. Springis, I. Tale, Univ. of Latvia (Latvia)
- 7142 OQ **A method for deposition of tungsten trioxide (WO₃)** [7142-47]
J. Martínez-Juárez, CIDS-ICUAP (Mexico); J. Díaz-Reyes, CIBA-IPN (Mexico)
- 7142 OR **Lattice vibrations study of In_xGa_{1-x}As_ySb_{1-y} quaternary alloys with low (In, As) content highly doped by tellurium grown by LPE** [7142-48]
J. Díaz-Reyes, CIBA-IPN (Mexico); E. López-Cruz, Instituto de Física Luis Rivera Terrazas (Mexico); J. G. Mendoza-Alvarez, CIBA-IPN (Mexico)
- 7142 OS **Manifestation of structural features in Raman spectra of LiNbO₃ single crystals** [7142-53]
P. Chufyrev, N. Sidorov, M. Palatnikov, Kola Science Ctr. RAS (Russian Federation); K. Bormanis, Univ. of Latvia (Latvia)
- 7142 OT **Quantum chemistry studies of the O K-edge x-ray absorption in WO₃ and AWO₃** [7142-12]
D. Bocharov, A. Kuzmin, J. Purans, Y. Zhukovskii, Univ. of Latvia (Latvia)
- 7142 OU **Optical gain dynamics in InGaIn/InGaIn quantum wells** [7142-55]
M. Karaliūnas, E. Kuokštis, K. Kazlauskas, S. Juršėnas, Vilnius Univ. (Lithuania); V. Hoffman, A. Knauer, Ferdinand-Braun-Institut für Höchstfrequenztechnik (Germany)

SESSION 5 ORGANIC OPTICAL MATERIALS

- 7142 0V **Preparation and properties of hybrid bilayer structures based on organic Alq3, ferromagnetic $\text{La}_{2/3}\text{Sr}_{1/3}\text{MnO}_3$ and Fe_3O_4** [7142-40]
B. Vengalis, K. Šliužienė, I. Černiukė, R. Butkutė, V. LISAUSKAS, A. Maneikis, Semiconductor Physics Institute (Lithuania)
- 7142 0W **The effects of external applied voltage on the nonlinear optical properties of a dye-doped nematic liquid crystal by using a single beam** [7142-39]
M. H. Majles Ara, R. Bahramian, M. Abolhasani, Tarbiat Modares Univ. (Iran)

SESSION 6 HOLOGRAPHY MATERIALS AND OPTICAL RECORDING

- 7142 0X **The problems of holographic information recording and storage: modern state** [7142-19]
B. S. Gurevich, Scientific Instruments Co. (Russian Federation); S. B. Gurevich, A.F. Ioffe Physical-Technical Institute (Russian Federation); A. Peckus, Institute of Physics (Lithuania)
- 7142 0Y **Some features of information theory application to holographic systems** [7142-18]
B. S. Gurevich, Scientific Instruments Co. (Russian Federation); S. B. Gurevich, A.F. Ioffe Physical-Technical Institute (Russian Federation); K. M. Jumaliev, Institute of Physics (Kyrgyzstan)
- 7142 0Z **Effects of light polarization and crystal orientation on the holographic recording efficiency in doped LiNbO_3 crystals** [7142-04]
A. Ozols, Riga Technical Univ. (Latvia); M. Reinfelds, Univ. of Latvia (Latvia)
- 7142 10 **Self-organizing laser induced Au nanocrystal formation in conditions of surface plasmon resonance** [7142-21]
L. Fedorenko, B. Snopok, M. Yusupov, Yu. Burlachenko, V. Lashkaryov Institute of Semiconductor Physics (Ukraine)
- 7142 11 **Investigation of As_2S_3 -Al films for dot-matrix holographic recording** [7142-20]
A. Bulanovs, V. Gerbreders, E. Sledevskis, V. Pashkevich, Daugavpils Univ. (Latvia); J. Teteris, Univ. of Latvia (Latvia)
- 7142 12 **Holographic recording in polymer composites of organic photochromes and chalcogenides** [7142-23]
A. Gerbreders, Univ. of Latvia (Latvia) and Daugavpils Univ. (Latvia); J. Teteris, Univ. of Latvia (Latvia); V. Kolobjonoks, Daugavpils Univ. (Latvia)

SESSION 7 BIO-OPTICS AND OPTICAL SENSING

- 7142 13 **Pulsed photoacoustic measurements of suspensions: in case study of mitochondrial NADH and its phantom** [7142-11]
Z. Zhao, Univ. of Oulu (Finland); J. Hast, VTT Technical Research Ctr. of Finland (Finland); R. Myllylä, Univ. of Oulu (Finland); M. Käsäkoski, VTT Technical Research Ctr. of Finland (Finland)

- 7142 14 **Micro-Raman scattering and infrared spectra of hemoglobin** [7142-38]
M. Polakovs, N. Mironova-Ulmane, Univ. of Latvia (Latvia); N. Kurjane, E. Reinholds, P. Stradins
Clinical Univ. Hospital (Latvia); M. Grube, Univ. of Latvia (Latvia)
- 7142 15 **Rough surfaces profile studies using acousto-optic tunable filter** [7142-17]
B. S. Gurevich, S. V. Andreyev, Scientific Instruments Co. (Russian Federation);
V. V. Shapovalov, I. A. Kolesov, Biotechnical Systems Research Institute (Russian Federation);
A. V. Belyaev, Institute for Analytical Instrumentation (Russian Federation)
- 7142 16 **The perception of isoluminant coloured stimuli of amblyopic eye and defocused eye**
[7142-37]
G. Krumina, M. Ozolinsh, G. Ikaunieks, Univ. of Latvia (Latvia)
- 7142 17 **Eye movements during silent and oral reading with stabilized versus free head movement
and different eye-trackers** [7142-15]
R. Paeglis, I. Jokste, K. Bagucka, I. Lacis, Univ. of Latvia (Latvia)
- 7142 18 **The energetical threshold of optical information detection due to thermal noise** [7142-05]
A. Ozols, J. Porins, G. Ivanovs, Riga Technical Univ. (Latvia)
- 7142 19 **Latvian and Russian textbooks: eye movements in reading text formatted in two columns**
[7142-16]
R. Paeglis, I. Gorshanova, K. Bagucka, I. Lacis, Univ. of Latvia (Latvia)
- 7142 1A **Factors affecting intraocular light scattering from different color straylight sources** [7142-30]
G. Ikaunieks, M. Ozolinsh, Univ. of Latvia (Latvia)
- 7142 1B **Electronic eye occluder with time-counting and reflection control** [7142-45]
V. Karitans, M. Ozolinsh, G. Kuprisha, Univ. of Latvia (Latvia)
- 7142 1C **Photoinduced AsSeS thin film phase plates as adaptive optics mirrors for eye aberration
correction** [7142-43]
S. Fomins, M. Reinfelds, Univ. of Latvia (Latvia); A. Larichev, N. Iroshnikov, Moscow State
Univ. (Russian Federation); A. Gerbreders, M. Ozolinsh, Univ. of Latvia (Latvia)

Author Index

Conference Committee

Conference Chair

Janis Spigulis, Institute of Atomic Physics and Spectroscopy,
University of Latvia (Latvia)

International Advisory Committee

Steponas Asmontas, Semiconductor Physics Institute (Lithuania)
Simon Gurevich, Ioffe Physical-Technical Institute (Russia)
Marco Kirm, Physics Institute (Estonia)
Andris Krumins, Institute of Solid State Physics, UL (Latvia)
Igor Meglinski, Cranfield University (United Kingdom)
Gediminas Račiukaitis, Physics Institute (Lithuania)
Sune Svanberg, Lund University (Sweden)

Program Committee

Andris Krumins, Institute of Solid State Physics, UL (Latvia)
Donats Millers, Institute of Solid State Physics, UL (Latvia)
Inta Muzikante, Institute of Solid State Physics, UL (Latvia)
Maris Ozolinsh, Department of Optometry and Vision Science, UL
(Latvia)
Andris Ozols, Institute of Technical Physics, RTU (Latvia)
Atis Skudra, Institute of Atomic Physics and Spectroscopy, UL (Latvia)
Andris Sternbergs, Institute of Solid State Physics, UL (Latvia)
Janis Teteris, Institute of Solid State Physics, UL (Latvia)
Vismants Zauls, Institute of Solid State Physics, UL (Latvia)

Local Organizing Committee

Dina Berzina, Institute of Atomic Physics and Spectroscopy, UL (Latvia)
Renars Erts, Institute of Atomic Physics and Spectroscopy, UL (Latvia)
Maria Mihanoshina, Institute of Atomic Physics and Spectroscopy, UL
Roberts Paeglis, Department of Optometry and Vision Science, UL
(Latvia)
Inga Shirante, Institute of Atomic Physics and Spectroscopy, UL
(Latvia)
Rita Veilande, Institute of Atomic Physics and Spectroscopy, UL
(Latvia)
Aivars Vembris, Institute of Solid State Physics, UL (Latvia)
Vismants Zauls, Institute of Solid State Physics, UL (Latvia)
Natalya Zorina, Institute of Atomic Physics and Spectroscopy, UL
(Latvia)

WE THANK OUR PARTNERS AND SPONSORS



**LATVIJAS
UNIVERSITATE**

ASI



SPIE

OSA[®]
Optical Society of America



STORAENSO

SIDRABE

GroGlass[™]

standa
OPTO-MECHANICAL
PRODUCTS



Latvian Council of Science

DIFRA^{sia}



Introduction

All papers included in this volume are collected from the Sixth International Conference on Advanced Optical Materials and Devices (AOMD-6) held 24–27 August 2008 in Riga, Latvia. Series of the AOMD conferences, the major optics and photonics event in the Baltic countries, started in Riga in August 1996. Since then the AOMD-brand has gained high reputation among optics and photonics professionals not only in the Baltics, but also in Scandinavia, Western Europe, North America, and other parts of the globe.

The AOMD-6 program comprised traditional topics like new inorganic and organic optical materials, materials for applications in holography and optical recording, semiconductor emitters/photodetectors, optical thin films, coatings and photovoltaics, as well as bio-optical technologies and optical sensors. Ten invited plenary lectures on the hottest topics have been presented, along with 36 regular oral reports and 45 poster reports. Scientists from 16 countries have contributed to this conference.

The AOMD-6 full papers published here will be useful for researchers, educators and engineers, as well as for students interested in recent developments of optical materials, photonic devices and their applications in industry and medicine.

On behalf of the organizing committees, I cordially thank all authors and reviewers for their contributions to this book.

Janis Spigulis
AOMD-6 Conference Chair

