

PROCEEDINGS OF SPIE

***Photonic Fiber and Crystal Devices:
Advances in Materials and
Innovations in Device Applications***

**Ruyan Guo
Shizhuo S. Yin
Francis T. S. Yu**
Editors

**26–27 August 2007
San Diego, California, USA**

Sponsored and Published by
SPIE

Volume 6698

Proceedings of SPIE, 0277-786X, v. 6698

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 *Photonic Fiber and Crystal Devices: Advances in Materials and Innovations in Device Applications*, edited by Ruyan Guo, Shizhuo S. Yin, Francis T. S. Yu, Proceedings of SPIE Vol. 6698 (SPIE, Bellingham, WA, 2007) Article CID Number.

ISSN 0277-786X

ISBN 9780819468468

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 © 2007, 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/07/\$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 Conference Committee

SESSION 1 ADVANCES IN MATERIALS SYNTHESIS, PROPERTY, AND CHARACTERIZATION I

- 6698 02 **Pyroelectric and ferroelectric semiconductors: dynamic holographic grating recording, generation of self-focused electron beam, x-rays, and neutrons (Invited Paper)** [6698-01]
N. V. Kukhtarev, T. V. Kukhtareva, P. Land, J. C. Wang, Alabama A&M Univ. (USA)
- 6698 03 **Evaluation and control of the dopant distribution in a Nd:LiNbO₃ fiber grown from the melt by the edge-defined film-fed growth (EFG) method** [6698-02]
L. Braescu, West Univ. of Timisoara (Romania); T. F. George, Univ. of Missouri, St. Louis (USA); S. Balint, West Univ. of Timisoara (Romania)
- 6698 04 **Mechanism of light-induced domain nucleation in LiNbO₃ crystals** [6698-03]
D. Liu, Y. Zhi, Z. Luan, A. Yan, L. Liu, Shanghai Institute of Optics and Fine Mechanics (China)
- 6698 05 **Photo-EPR studies of photorefractive BaTiO₃ heavily doped with Cr³⁺: evidence of photo-induced dissociation of Cr³⁺ dimers** [6698-04]
S. R. Bairavarasu, M. E. Edwards, Alabama A&M Univ. (USA); M. D. Sastry, Alabama A&M Univ. (USA) and Gemological Institute of India (India); T. Kukhtareva, H. M. Jaenisch, R. H. Hawrami, Alabama A&M Univ. (USA); D. Lianos, U.S. Army Space and Missile Defense Command (USA); M. D. Aggarwal, Alabama A&M Univ. (USA) and NASA Marshall Space Flight Ctr. (USA)
- 6698 06 **Photoluminescence, FTIR, and laser-Raman spectroscopic studies of PMN-PT containing iron** [6698-05]
S. R. Bairavarasu, M. E. Edwards, T. Kukhtareva, Alabama A&M Univ. (USA); M. D. Sastry, Alabama A&M Univ. (USA) and Gemological Institute of India (India); D. Lianos, U.S. Army Space and Missile Defense Command (USA); P. Kommidi, B. R. Reddy, H. M. Jaenisch, Alabama A&M Univ. (USA); M. D. Aggarwal, Alabama A&M Univ. (USA) and NASA Marshall Space Flight Ctr. (USA)

SESSION 2 ADVANCES IN MATERIALS SYNTHESIS, PROPERTY, AND CHARACTERIZATION II

- 6698 07 **Photopolymer materials for holographic data storage applications (Invited Paper)** [6698-06]
J. T. Sheridan, M. R. Gleeson, C. E. Close, D. Sabol, Univ. College Dublin (Ireland)
- 6698 09 **PbTe thin films grown by femtosecond pulsed laser deposition** [6698-08]
E. Rodriguez, D. Silva, L. Moya, C. L. Cesar, L. C. Barbosa, A. Schrank, C. R. Souza Filho, E. P. de Oliveira, Univ. Estadual de Campinas (Brazil)

- 6698 0A **Nonlinear optical and electronic properties of SiC/PMMA/Ge/Fe waveguide for device applications** [6698-09]
A. Darwish, Dillard Univ. (USA) and Laser Matter Research Lab. (USA); B. Koplitz, Tulane Univ. (USA); N. Kukhtarev, Alabama A&M Univ. (USA); X. Zhang, R. Combs, Tulane Univ. (USA); H. Elhkaby, Dillard Univ. (USA); A. Darwish, Univ. of New Orleans (USA); K. Ransom, B. Conyer, Dillard Univ. (USA)

SESSION 3 DEVELOPMENT IN COMPONENT AND INTEGRATIVE PHOTONIC DEVICES

- 6698 0E **Fiber-optic photo-acoustic spectroscopy sensor for harsh environment gas detection** [6698-13]
J. Wu, K.-L. Deng, R. Guida, B. Lee, Global Research Ctr., General Electric (USA)
- 6698 0F **High temperature sensing using higher-order-mode rejected sapphire-crystal fiber gratings** [6698-14]
C. Zhan, J. H. Kim, J. Lee, S. Yin, The Pennsylvania State Univ. (USA); P. Ruffin, U.S. Army Aviation and Missile Command (USA); C. Luo, General Opto Solutions, LLC (USA)

SESSION 4 DEVELOPMENT IN COMPONENT AND INTEGRATIVE PHOTONIC DEVICES II

- 6698 0I **Using an optimized high-index ITO overlay on a single resonant band LPG to enhance the tunable range while maintaining the resonant peak depth** [6698-17]
J. Lee, Q. Chen, Q. Zhang, The Pennsylvania State Univ. (USA); K. Reichard, Applied Research Lab., The Pennsylvania Univ. (USA); D. Ditto, J. Mazurowski, Electro-Optics Ctr., The Pennsylvania Univ. (USA); M. Hackert, NAVAIR (USA); S. Yin, The Pennsylvania State Univ. (USA)
- 6698 0K **Speckles removal from 3D images by empirical mode decomposition** [6698-19]
W.-H. Su, G.-L. Chen, C.-Y. Kuo, National Sun Yat-Sen Univ. (Taiwan)

SESSION 5 NOVEL MATERIALS AND DEVICES: THEORETICAL AND EXPERIMENTAL APPROACHES I

- 6698 0M **Dispersion relations for negative index materials and slow light (Invited Paper)** [6698-21]
P. P. Banerjee, G. Nehmetallah, R. Aylo, Univ. of Dayton (USA); P. Buranasiri, King Mongkut's Institute of Technology Ladkrabang (Thailand)

SESSION 6 NOVEL MATERIALS AND DEVICES: THEORETICAL AND EXPERIMENTAL APPROACHES II

- 6698 0P **RGB generation by four-wave mixing in small-core holey fibers (Invited Paper)** [6698-24]
P. Horak, P. Dupriez, F. Poletti, M. N. Petrovich, Y. Jeong, J. Nilsson, D. J. Richardson, D. N. Payne, Univ. of Southampton (United Kingdom)
- 6698 0T **Study of elastic nonlinearity of the crystals used to control optical beams** [6698-28]
S. V. Kulakov, V. V. Kludzin, O. V. Shakin, St. Petersburg State Univ. of Aerospace Instrumentation (Russia)

SESSION 7 INNOVATIONS IN OPTIC AND PHOTONIC APPLICATIONS I

- 6698 0U **Molecular probes based on microstructured fibers and surface enhanced Raman scattering (Invited Paper)** [6698-29]
Y. Zhang, C. Shi, C. Gu, L. Seballos, A. Schwartzberg, J. Z. Zhang, Univ. of California, Santa Cruz (USA); B. Chen, NASA Ames Research Ctr. (USA)
- 6698 0W **Time resolved profile measurements for ultra-fast vibrating objects (Invited Paper)** [6698-31]
W.-H. Su, C.-Y. Kuo, National Sun Yat-Sen Univ. (Taiwan)
- 6698 0X **Numerical simulation of supercontinuum generation in GeO₂ doped fiber** [6698-32]
Y. Liu, National Institute of Standards and Technology (USA); J. E. Sharping, Univ. of California, Merced (USA); M. T. Cicerone, National Institute of Standards and Technology (USA)

SESSION 8 INNOVATIONS IN OPTIC AND PHOTONIC APPLICATIONS II

- 6698 0Z **Supercontinuum generation in single crystal sapphire fibers (Invited Paper)** [6698-34]
S. S. Yin, J. H. Kim, C. Zhan, J. W. An, J. Lee, The Pennsylvania State Univ. (USA); P. Ruffin, E. Edwards, C. Brantley, U.S. Army Aviation and Missile Command (USA); C. Luo, General Opto Solutions, LLC (USA)
- 6698 11 **3D shape reconstruction using multiple projections: a method to eliminate shadowing for projected fringe profilometry** [6698-36]
W.-H. Su, C.-Y. Kuo, National Sun Yat-Sen Univ. (Taiwan)
- 6698 12 **3D shape reconstruction using projected fringe profilometry for an image blurred by linear motion** [6698-37]
C.-Y. Kuo, C.-K. Lee, W.-H. Su, National Sun Yat-Sen Univ. (Taiwan)

POSTER SESSION

- 6698 14 **Near infrared nonvolatile holographic recording in doubly doped LiNbO₃:Fe crystals** [6698-39]
D. Li, D. Liu, Y. Zhi, W. Lu, L. Liu, Shanghai Institute of Optics and Fine Mechanics (China)
- 6698 15 **Quasi-nonvolatile holographic storage in doubly-doped LiNbO₃ crystals** [6698-40]
Z. Chai, East China Normal Univ. (China); D. Liu, L. Liu, Y. Zhi, D. Li, Shanghai Institute of Optics and Fine Mechanics (China)
- 6698 16 **Study of wavelength-dependent diffraction properties of photorefractive volume holographic lenses for optical beams conversion** [6698-41]
Z. Hu, Shanghai Normal Univ. (China); A. Yan, D. Liu, L. Liu, Shanghai Institute of Optics and Fine Mechanics (China)
- 6698 18 **Mode confinement of light wave propagation in a new polymeric waveguide studied by the *m*-lines technique** [6698-43]
K. Sathiyamoorthy, P. A. Kurian, C. Vijayan, M. P. Kothiyal, Indian Institute of Technology Madras (India)

- 6698 19 **Crosstalk in speckle-based volume holographic multiplexing** [6698-45]
H. Liu, M. Gu, A. S. Bhalla, R. Guo, The Pennsylvania State Univ. (USA)
- 6698 1C **Stoichiometric lithium niobate thin films preparation by sol-gel method** [6698-48]
A. R. Poghosyan, Institute for Physical Research (Armenia); R. Guo, The Pennsylvania State Univ. (USA); A. L. Manukyan, S. G. Grigoryan, Institute for Physical Research (Armenia)
- 6698 1D **Sol-gel method of p-type zinc oxide films preparation** [6698-49]
A. R. Poghosyan, Institute for Physical Research (Armenia); X. Li, National Renewable Energy Lab. (USA); A. L. Manukyan, S. G. Grigoryan, E. S. Vardanyan, Institute for Physical Research (Armenia)
- 6698 1E **Design of single-mode polarization splitter with a configuration of asymmetric Y-junction in two-dimensional honeycomb photonic crystal** [6698-50]
R.-S. Chen, H.-B. Wei, Lunghwa Univ. of Science and Technology (Taiwan)
- 6698 1F **The analysis of the mid-infrared fibers features induced by the high energy propagated waves** [6698-51]
T. Tulaikova, Institute for Geospheres Dynamics (Russia); L. Butvina, Fiber Optics Research Ctr. (Russia); T. K. Orr, I. Khmyriva, Y. Igarashi, The Univ. of Aizu (Japan)
- 6698 1G **Photopolymer material used in the recording of slanted gratings** [6698-52]
D. Sabol, M. R. Gleeson, C. E. Close, S. Liu, J. T. Sheridan, Univ. College Dublin (Ireland)
- 6698 1H **Optical and magneto-optical properties of $\text{Bi}_{1.8}\text{Y}_{1.2}\text{Fe}_4\text{Ga}_1\text{O}_{12}$ nanoparticles** [6698-53]
S. Kang, Opteos Inc. (USA); C. Yang, M. Chun, S. Yin, The Pennsylvania State Univ. (USA)
- 6698 1I **Investigation of domain inversion and internal field in congruent lithium niobate by digital holographic interferometry** [6698-54]
Y. Zhi, D. Liu, W. Qu, Y. Zhou, Z. Luan, J. Sun, A. Yan, L. Liu, Shanghai Institute of Optics and Fine Mechanics (China)
- 6698 1J **Broadband supercontinuum generation by bridging two separate supercontinua pumped at two different IR wavelengths** [6698-55]
J. H. Kim, C. Zhan, S. Yin, The Pennsylvania State Univ. (USA)
- 6698 1K **Holographic fixing with modulated light in two-center holographic recording** [6698-56]
Y. Zhou, L. Liu, D. Liu, A. Yan, Y. Zhi, Shanghai Institute of Optics and Fine Mechanics (China)
- 6698 1M **Implementation of optical WDM by anisotropic Bragg diffraction in photorefractive LiNbO_3 crystal** [6698-58]
H. Liu, X. Yan, R. Zhu, C. Yang, Shanghai Univ. (China)
- 6698 1O **Laser emission from dye mixture doped polymer optical fiber** [6698-61]
S. Mavila, T. Kannampuzha Jhony, R. Mandamparambil, N. Kumar, P. A. Cherian, N. P. N. Vadakkedathu, R. Padmanabhan, Cochin Univ. of Science and Technology (India)

- 6698 1P **Acousto-optically tunable laser** [6698-60]
 S. V. Kulakov, St. Petersburg State Univ. of Aerospace Instrumentation (Russia);
 Yu. M. Mokrushin, Yu. G. Gradoboyev, St. Petersburg State Polytechnical Univ. (Russia);
 O. V. Shakin, A.F. Ioffe Physico-Technical Institute (Russia); V. V. Kludzin, St. Petersburg State
 Univ. of Aerospace Instrumentation (Russia)
- 6698 1Q **Nanosecond electrical and optical pulses and self phase conjugation from photorefractive
 lithium niobate fibers and crystals** [6698-62]
 N. Kukhtarev, T. Kukhtareva, M. Curley, H. M. Jaenisch, M. E. Edwards, Alabama A&M Univ.
 (USA); M. Gu, Z. Zhou, R. Guo, The Pennsylvania State Univ. (USA)

Author Index

Conference Committee

Conference Chairs

Ruyan Guo, The Pennsylvania State University (USA)
Shizhuo S. Yin, The Pennsylvania State University (USA)
Francis T. S. Yu, The Pennsylvania State University (USA)

Program Committee

Partha P. Banerjee, University of Dayton (USA)
Kung-Li Deng, GE Global Research (USA)
Joseph Grant, NASA Stennis Space Center (USA)
Ken Y. Hsu, National Chiao Tung University (Taiwan)
Tracy D. Hudson, U.S. Army Aviation and Missile Research,
Development and Engineering Center (USA)
Suganda Jutamulia, Consultant (China)
Eckhard Kratzig, Universität Osnabrück (Germany)
John S. Kruger, U.S. Army Research Office (USA)
Nickolai V. Kukhtarev, Alabama A&M University (USA)
Ravindra B. Lal, Alabama A&M University (USA)
Byoungcho Lee, Seoul National University (South Korea)
Sergei F. Lyuksyutov, University of Akron (USA)
Karl M. Reichard, The Pennsylvania State University (USA)
Gérald Roosen, Institut d'Optique (France)
Paul B. Ruffin, U.S. Army Aviation and Missile Research, Development
and Engineering Center (USA)
Ching-Cherng Sun, National Central University (Taiwan)

Session Chairs

- 1 Advances in Materials Synthesis, Property, and Characterization I
Ruyan Guo, The Pennsylvania State University (USA)
- 2 Advances in Materials Synthesis, Property, and Characterization II
Narsingh B. Singh, Northrop Grumman Corporation (USA)
- 3 Development in Component and Integrative Photonic Devices
Abdalla M. Darwish, Dillard University (USA)
- 4 Development in Component and Integrative Photonic Devices II
Ravindra B. Lal, Alabama A&M University (USA)

- 5 Novel Materials and Devices: Theoretical and Experimental Approaches I
Shizhuo S. Yin, The Pennsylvania State University (USA)
 - 6 Novel Materials and Devices: Theoretical and Experimental Approaches II
Sergei F. Lyuksyutov, University of Akron (USA)
 - 7 Innovations in Optic and Photonic Applications I
Shizhuo S. Yin, The Pennsylvania State University (USA)
 - 8 Innovations in Optic and Photonic Applications II
Paul B. Ruffin, U.S. Army Aviation and Missile Research, Development and Engineering Center (USA)
- Poster Session
Shizhuo S. Yin, The Pennsylvania State University (USA)