

PROCEEDINGS OF SPIE

Nanostructured Thin Films VII

Akhlesh Lakhtakia
Tom G. Mackay
Motofumi Suzuki
Editors

20–21 August 2014
San Diego, California, United States

Sponsored and Published by
SPIE

Volume 9172

Proceedings of SPIE 0277-786X, V. 9172

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

Nanostructured Thin Films VII, edited by Akhlesh Lakhtakia, Tom G. Mackay, Motofumi Suzuki,
Proc. of SPIE Vol. 9172, 917201 · © 2014 SPIE · CCC code: 0277-786X/14/\$18 · doi: 10.1117/12.2081268

Proc. of SPIE Vol. 9172 917201-1

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 *Nanostructured Thin Films VII*, edited by Akhlesh Lakhtakia, Tom G. Mackay, Motofumi Suzuki, Proceedings of SPIE Vol. 9172 (SPIE, Bellingham, WA, 2014) Article CID Number.

ISSN: 0277-786X

ISBN: 9781628411997

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 © 2014, 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/14/\$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the 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 as 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

v *Authors*
vii *Conference Committee*

KEYNOTE SESSION

9172 02 **Low dimensional optics (Keynote Paper)** [9172-1]

SESSION 1 FUNCTIONAL NANOSTRUCTURES I

9172 03 **Confined modes on a meta-surface** [9172-2]

9172 04 **Design a symmetrical film stack as a negative index metamaterial** [9172-3]

SESSION 2 FUNCTIONAL NANOSTRUCTURES II

9172 06 **Nanostructured thin films and their macrobehaviors (Invited Paper)** [9172-5]

9172 07 **Nano-structures for high intensity fiber laser applications** [9172-7]

9172 09 **PbS sculptured thin film and their effect on liquid crystals alignment** [9172-43]

SESSION 3 TOWARDS APPLICATIONS I

9172 0A **New physics and applications of apertures in thin metal films (Invited Paper)** [9172-9]

9172 0B **Nanostructured refractory thin films for solar applications** [9172-10]

9172 0D **Stretchable conducting materials with multi-scale hierarchical structures for biomedical applications** [9172-12]

SESSION 4 THEORETICAL AND NUMERICAL STUDIES

9172 0F **Computer-based numerical simulations of adsorption in nanostructures** [9172-14]

9172 0G **Waves in tape helix loaded liquid crystal optical fiber** [9172-15]

9172 0H **Shift happens: optical sensing with Dyakonov-Tamm waves** [9172-16]

9172 0I **Voigt waves in electro-optic homogenized composite materials** [9172-17]

SESSION 5 CHARACTERIZATION

- 9172 0J **Local field enhancement effects for dielectric coatings on silver nanorod arrays (Invited Paper)** [9172-18]
- 9172 0K **Study of partial discharge characteristics of nano filled polypropylene films according to the variation in electric field distribution on the sample** [9172-19]
- 9172 0L **Ultra-thin metal oxide based light controlled converter for sensing surface chemicals** [9172-20]
- 9172 0M **Magnetic, magneto-optical, and magnetotransport properties of Ti-substituted Co_2FeGa thin films** [9172-21]

SESSION 6 FUNCTIONAL NANOSTRUCTURES III

- 9172 0O **Investigation into the effect of space charges on the surface erosion of synthetic and natural organoclay nanofilled PP films** [9172-23]
- 9172 0P **Optical properties of porphyrin: graphene oxide composites** [9172-24]

SESSION 7 TOWARDS APPLICATIONS II

- 9172 0R **Nanocrystalline cellulose for optical encryption (Invited Paper)** [9172-26]
- 9172 0T **Optical, electrical and structural study of metallic nano-structured thin films fabricated by oblique angle deposition** [9172-28]
- 9172 0V **Mimemes for SUBTLE applications** [9172-30]

SESSION 8 FABRICATION

- 9172 0W **Bottom-up fabrication of non-close-packed nanopillar arrays for photonic applications** [9172-31]
- 9172 0X **Tungsten-oxide thin films of dense, columnar, and chiral morphologies** [9172-32]
- 9172 0Y **The effect of the substrate temperature and the acceleration potential drop on the structural and physical properties of SiC thin films deposited by TVA method** [9172-33]

POSTER SESSION

- 9172 11 **Deposition condition influence on optical properties of indium tin oxide** [9172-36]
- 9172 14 **Effect of aging with partial discharges on the remnant breakdown strength of polypropylene films with natural and synthetic nanofillers** [9172-39]

Authors

Numbers in the index correspond to the last two digits of the six-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first four digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

Abdulhalim, Ibrahim, 09
Al-Attar, Nebras, 0P
Al-Balushi, Ahmed A., 0A
Allahverdyan, Karen, 0R
Al-Shammari, Rusul M., 0P
Andrews, Mark P., 0R
Antohe, Stefan, 0Y
Basappa, Prathap, 0K, 0O, 14
Berginc, G., 02
Bonakdar, Alireza, 0T
Bozhko, Alexei, 0M
Bukauskas, Virginijus, 0L
Chaudhary, Ashok, 09
Chen, Shuwen, 0A
Chichay, Ksenia, 0M
Chodavarapu, Vamsy P., 0R
Choudhury, P. K., 0G
Ciupina, Victor, 0Y
Dellea, O., 0B
Dhara, Rohitha, 0K, 0O, 14
Dinca, Virginia, 0Y
Drazdys, Ramutis, 0X
Dunoyer, N., 0B
Escoubas, Ludovic, 02
Faryad, Muhammad, 0H
Felbacq, Didier, 03
Flory, F., 02
Galstian, Tigran, 0R
Gan'shina, Elena, 0M
Gelfand, Ryan F., 0A
Ghasemi, Masih, 0G
Gordon, Reuven, 0A
Hanulia, Taras O., 11
Harsha Vardhan Reddy, M., 0P
Hong, L. Y., 07
Iftimie, Sorina, 0Y
Jang, Sung Jun, 0T
Jen, Yi-Jun, 04, 0J
Jepu, Ionuț, 0Y
Jheng, Ci-Yao, 04, 0J
Jin, Shilong, 0A
Kainuma, Ryosuke, 0M
Kaneko, Yasuyuki, 0W
Keyes, Tia E., 0P
Khashimova, Diana, 0F
Khuo, E. H., 07
Khovaylo, Vladimir, 0M
Kim, Hyun, 0D
Kirk, Andrew G., 0R
Klebanov, Matvey, 09
Kling, Emmanuel, 03
Kotnala, Abhay, 0A
Lakhtakia, Akhlesh, 0H, 0V, 0X
Lee, Cheng-Chung, 02, 06
Lendel, Vasyi V., 11
Le-Rouzo, J., 02
Liao, Shih-Fang, 06
Lin, Meng-Jie, 0J
Liu, Wei-Chih, 04, 0J
Liu, Z., 07
Lo, Mei-Ling, 06
Lopatynska, Olga, 11
Lopez, Sergio, 0P
Lungu, Cristian P., 0Y
Lyange, Maria, 0M
Mackay, Tom G., 0I
Mandes, Aurelia, 0Y
Mironas, Audružis, 0L
Mohseni, Hooman, 0T
Morse, Timothy, 0R
Ngo, C. Y., 07
Nicolescu, Virginia, 0Y
Novikov, Andrey, 0M
Ohtsuka, Makoto, 0M
Okubo, Akinari, 0M
Ollier, E., 0B
Poda, Anil B., 0K, 14
Poperenko, Leonid V., 11
Porosnicu, Corneliu, 0Y
Prodan, Gabriel C., 0Y
Prodan, Madalina, 0Y
Rab, Md. Afzalur, 0K, 0O, 14
Razafindrakoto, Richard, 03
Rice, James H., 0P
Rodionova, Valeria, 0M
Rousseau, Emmanuel, 03
Šetkus, Arūnas, 0L
Shim, Bong Sup, 0D
Stanescu, Iuliana, 0Y
Suganuma, Shinta, 0W
Suzuki, Motofumi, 0W
Swiontek, Stephen, 0X
Szabolcs, H., 0B
Teng, J. H., 07
Tolenis, Tomas, 0X
Umetsu, Rie Y., 0M
Vasile, Eugeniu, 0Y
Vaškėlis, Šarūnas, 0L

Vladoiu, Rodica, 0Y
Wheaton, Skylar, 0A
Wu, R. F., 07
Yang, Chih-Chieh, 04
Zarovski, Valeriu, 0Y
Zhang, Yu Ping, 0R
Zykov, Georgy, 0M

Conference Committee

Symposium Chairs

Satoshi Kawata, Osaka University (Japan)
Manijeh Razeghi, Northwestern University (United States)

Symposium Co-chairs

David L. Andrews, University of East Anglia Norwich (United Kingdom)
James G. Grote, Air Force Research Laboratory (United States)

Conference Chairs

Akhlesh Lakhtakia, The Pennsylvania State University (United States)
Tom G. Mackay, The University of Edinburgh (United Kingdom)
Motofumi Suzuki, Kyoto University (Japan)

Conference Program Committee

Bharat Bhushan, The Ohio State University (United States)
Pankaj K. Choudhury, University Kebangsaan Malaysia (Malaysia)
Didier Felbacq, Université Montpellier 2 (France)
Flavio Horowitz, Universidade Federal do Rio Grande do Sul (Brazil)
Yi-Jun Jen, National Taipei University of Technology (Taiwan)
H. Angus Macleod, Thin Film Center, Inc. (United States)
Raúl J. Martín-Palma, Universidad Autónoma de Madrid (Spain)
Anders Kristensen, Technical University of Denmark (Denmark)
Sidney J. Ribeiro, Universidade Estadual Paulista (Brazil)
Geoffrey B. Smith, University of Technology, Sydney (Australia)

Session Chairs

Keynote Session
Akhlesh Lakhtakia, The Pennsylvania State University (United States)

Functional Nanostructures I
Motofumi Suzuki, Kyoto University (Japan)

Functional Nanostructures II
François R. Flory, Institut Matériaux Microélectronique Nanosciences
de Provence (France)

Towards Applications I
Cheng-Chung Lee, National Central University (Taiwan)

Theoretical and Numerical Studies

Reuven Gordon, University of Victoria (Canada)

Characterization

Qiaoqiang Gan, University at Buffalo (United States)

Functional Nanostructures III

Yi-Jun Jen, National Taipei University of Technology (Taiwan)

Towards Applications II

Tom G. Mackay, The University of Edinburgh (United Kingdom)

Fabrication

Ahmadreza Hajiaboli, McGill University (Canada)