

# PROCEEDINGS OF SPIE

[SPIDigitalLibrary.org/conference-proceedings-of-spie](https://spiedigitallibrary.org/conference-proceedings-of-spie)

## Front Matter: Volume 7402

, "Front Matter: Volume 7402," Proc. SPIE 7402, Nanoengineering:  
Fabrication, Properties, Optics, and Devices VI, 740201 (8 September 2009);  
doi: 10.1117/12.844940

**SPIE.**

Event: SPIE NanoScience + Engineering, 2009, San Diego, California, United States

# PROCEEDINGS OF SPIE

## ***Nanoengineering: Fabrication, Properties, Optics, and Devices VI***

**Elizabeth A. Dobisz**

**Louay A. Eldada**

*Editors*

**4-5 August 2009**

**San Diego, California, United States**

*Sponsored and Published by*  
SPIE

**Volume 7402**

Proceedings of SPIE, 0277-786X, v. 7402

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 *Nanoengineering: Fabrication, Properties, Optics, and Devices VI*, edited by Elizabeth A. Dobisz, Louay A. Eldada, Proceedings of SPIE Vol. 7402 (SPIE, Bellingham, WA, 2009) Article CID Number.

ISSN 0277-786X  
ISBN 9780819476920

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 © 2009, 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](http://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/09/\$18.00.

Printed in the United States of America.

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

The logo for SPIE Digital Library, featuring the word "SPIE" in a bold, sans-serif font above the words "Digital Library" in a smaller, sans-serif font. To the right of the text is a stylized graphic consisting of three vertical bars of increasing height from left to right, with a curved line above them.

[SPIDigitalLibrary.org](http://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

- vii *Conference Committee*
- ix *Introduction*
- xi *Sub-nanometer resolution for the inspection of reflective surfaces using white light (Plenary Paper) [7405-37]*  
*W. Jüptner, T. Bothe, Bremer Institut für angewandte Strahltechnik (Germany)*

---

## FUTURE TRENDS IN NANOENGINEERING

- 7402 03 **Enhancing the performance of photonic DNA nanomachines for implementing photonic nanoscale automaton (Invited Paper) [7402-02]**  
T. Nishimura, Y. Ogura, J. Tanida, Osaka Univ. (Japan)
- 7402 04 **Novel fabrication and optoelectronic property of semiconductor filaments by optical-fiber thermal drawing [7402-03]**  
D. S. Deng, N. Orf, A. F. Abouraddy, Y. Fink, Massachusetts Institute of Technology (United States)

---

## NANOTECHNOLOGIES FOR PRINTED ELECTRONICS AND PHOTOVOLTAICS

- 7402 06 **Nanoscale self-assembly of high-efficiency copper indium gallium selenide photovoltaic thin films (Invited Paper) [7402-05]**  
L. Eldada, HelioVolt Corp. (United States)
- 7402 07 **Enhanced photoresponse of inkjet printed ZnO thin films induced by chemically capped CdS nanoparticles by dip coating [7402-06]**  
Y. Wu, T. Tamaki, T. Volotinen, A. Riazanova, L. Belova, K. V. Rao, Royal Institute of Technology (Sweden)

---

## SENSING NANOSTRUCTURES

- 7402 0A **Real time micro/nano particle detection and tracking with nanosecond resolution [7402-09]**  
F. Qian, Q. Song, E. Tien, O. Boyraz, Univ. of California, Irvine (United States)
- 7402 0C **Modeling of GaN/AlN heterostructure-based nano pressure sensors [7402-11]**  
S. Patil, Wilfrid Laurier Univ. (Canada); N. Sinha, Massachusetts Institute of Technology (United States); R. V. N. Melnik, Wilfrid Laurier Univ. (Canada)

---

## TOWARD SINGLE PHOTON AND SINGLE ELECTRON NANODEVICES

---

- 7402 0G **Highly directional emission from ultra-small photonic crystal resonators** [7402-19]  
S.-H. Kim, California Institute of Technology (United States); Y.-H. Lee, Korea Advanced Institute of Science and Technology (Korea, Republic of); J. Huang, A. Scherer, California Institute of Technology (United States)
- 7402 0H **Characterization of single electron effects in nanoscale MOSFETs** [7402-20]  
L. Forbes, D. A. Miller, Oregon State Univ. (United States)
- 7402 0I **InSb nanowire based field effect transistor** [7402-21]  
X. Jing, M. Penchev, J. Zhong, R. Paul, M. Ozkan, C. Ozkan, Univ. of California, Riverside (United States)

---

## PHOTONIC CRYSTALS AND NANOPHOTONIC INTEGRATED CIRCUITS

---

- 7402 0L **Polymer photonic crystal dye lasers as label free evanescent cell sensors** [7402-17]  
M. B. Christiansen, J. M. Lopacinska, M. H. Jakobsen, N. A. Mortensen, M. Dufva, A. Kristensen, Technical Univ. of Denmark (Denmark)

---

## NANOENGINEERING DESIGNS AND PROCESSES

---

- 7402 0N **Environment for thin-film manufacturing process development for product engineering of micro and nano devices** [7402-22]  
D. Ortloff, Process Relations GmbH (Germany); K. Hahn, Univ. of Siegen (Germany); J. Popp, Process Relations GmbH (Germany); T. Schmidt, R. Brück, Univ. of Siegen (Germany)
- 7402 0O **Optimizing and engineering PbSe/PbSrSe quantum well laser structures: SQW, SQW-SCH, MQW, and MMQW** [7402-23]  
M. Khodr, Hariri Canadian Univ. (Lebanon)
- 7402 0P **Sensitization of erbium in silicon oxide by evaporation and thermal oxidation** [7402-24]  
H. Alizadeh, L. Qian, N. P. Kherani, S. Zukotynski, Univ. of Toronto (Canada)

---

## 2D AND 3D NANOSTRUCTURES

---

- 7402 0S **Undesired effects of nanostructured thin films** [7402-28]  
G. Thériault, R. Tremblay, N. McCarthy, COPL, Univ. Laval (Canada)

---

## POSTER SESSION

---

- 7402 0T **Characterization of additive influence on reaction sintering of nano aluminum titanate** [7402-25]  
M. Khosravi Saghezchi, K. N. Toosi Univ. of Technology (Iran, Islamic Republic of); M. Biazar Markie, R. Ajami, H. Sarpoolaky, Iran Univ. of Science and Technology (Iran, Islamic Republic of)

- 7402 0U **Nanoimprint lithography for complex 3D micro-nano structures replication under low temperature** [7402-29]  
H. Sun, Hohai Univ. (China); J. Liu, D. Chen, Shanghai Jiao Tong Univ. (China)
- 7402 0X **Blue-sensitive nanoparticle-polymer composites for volume holographic recording** [7402-33]  
K. Omura, K. Gotoh, Y. Tomita, The Univ. of Electro-Communications (Japan); K. Ohmori, M. Hidaka, Nissan Chemical Industries, Ltd. (Japan)
- 7402 10 **Synthesis and characterization of electrospun gallium nitride nanofibers** [7402-36]  
A. Meléndez, K. Morales, I. Ramos, Univ. de Puerto Rico en Humacao (Puerto Rico); E. Campo, Lehigh Univ. (United States); J. J. Santiago-Avilés, Univ. of Pennsylvania (United States)
- 7402 12 **Bandgap tuning of photonic crystals on III-V nitride thin films** [7402-39]  
H. Yalamanchili, L. A. Hornak, D. Korakakis, J. M. Dawson, West Virginia Univ. (United States)

*Author Index*



# Conference Committee

## *Symposium Chairs*

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

## *Conference Chairs*

**Elizabeth A. Dobisz**, Hitachi Global Storage Technologies, Inc.  
(United States)  
**Louay A. Eldada**, HelioVolt Corporation (United States)

## *Program Committee*

**Andre-Jean Attias**, Université Pierre et Marie Curie (France)  
**Gregory J. Exarhos**, Pacific Northwest National Laboratory  
(United States)  
**Cynthia Hanson**, Space and Naval Warfare Systems Command  
(United States)  
**Daniel J. C. Herr**, Semiconductor Research Corporation (United States)  
**Ghassan E. Jabbour**, Arizona State University (United States)  
**Miguel Levy**, Michigan Technological University (United States)  
**Robert Magnusson**, University of Connecticut (United States)  
**Juan R. Maldonado**, Stanford University (United States)  
**Jun Tanida**, Osaka University (Japan)  
**Chee Wei Wong**, Columbia University (United States)  
**Gabriel Zeltzer**, Hitachi Global Storage Technologies (United States)

## *Session Chairs*

- 1 Future Trends in Nanoengineering  
**Louay A. Eldada**, HelioVolt Corporation (United States)
- 2 Nanotechnologies for Printed Electronics and Photovoltaics  
**Louay A. Eldada**, HelioVolt Corporation (United States)
- 3 Sensing Nanostructures  
**Louay A. Eldada**, HelioVolt Corporation (United States)
- 4 Self-Assembled Nanostructures and Nanoimprint Technologies  
**Louay A. Eldada**, HelioVolt Corporation (United States)
- 5 Toward Single Photon and Single Electron Nanodevices  
**Shadi A. Dayeh**, Los Alamos National Laboratory (United States)



- 6 Photonic Crystals and Nanophotonic Integrated Circuits  
**Louay A. Eldada**, HelioVolt Corporation (United States)
- 7 Nanoengineering Designs and Processes  
**Louay A. Eldada**, HelioVolt Corporation (United States)
- 8 2D and 3D Nanostructures  
**Yusuke Ogura**, Osaka University (Japan)

## Introduction

This volume features contributions from scientists and engineers in the general area of nanoengineering. Over the past couple of years, mature technologies such as logic, memory, and data storage have been rapidly thrust into the sub-100 nm regime. Existing processes of record have been extended well beyond the ranges previously deemed feasible or reliable. New technologies such as advanced photovoltaics, biotechnology, medical nanosystems, 3D sensors, 3D displays, systems on a chip, optofluidics, nanophotonics, and molecular electronics and optics are emerging. The upcoming synthesized nanomaterials, nanotubes, and nanowires, offer extremely attractive novel physical properties with many opportunities. Continuing improvements in the design and fabrication of micro/nano/quantum-scale optical elements have driven the development of both passive and active miniature optical components with ever more diverse applications. New applications include optical communication, neural systems, optical information processing, optical computing, optical storage, optical scanning, smart pixel arrays, information display, imaging, printing, medical diagnosis, and chemical and biological sensing. Emerging nanotechnologies present new opportunities and challenges in materials processing, device design and integration. Commercial drivers have increased functionality over reduced size, performance, reliability, and cost.

The proceedings of the Nanoengineering Conference include discussions of novel materials fabrication and processing, properties of nanostructures, innovative patterning and processing techniques, micro/nano/quantum optics, and fabrication and packaging of miniature devices. The innovations reflected in these papers range from driving existing schemes and processes to new limits to totally novel concepts and designs. Papers from academic and research institutions push the state of the art in miniaturization, level of integration, and performance figures of merit; papers from the industry require yield and tolerances as new design criteria, and nanofabrication manufacturing methods are exploited to make commercially deployed products.

Although this volume cannot include all the recent important work in the vast field of nanoengineering, it does cover a significant cross-section of the advances happening globally in areas where nanoengineering is making an impact. We hope these papers by world-renown experts serve the purpose of bringing the readers up to date on the state of the art in this fast-growing and exciting field.

**Elizabeth A. Dobisz**  
**Louay A. Eldada**

