

PROCEEDINGS OF SPIE

***Nanobiosystems: Processing,
Characterization, and
Applications II***

**Norihisa Kobayashi
Fahima Ouchen
Ileana Rau**
Editors

**5-6 August 2009
San Diego, California, United States**

Sponsored and Published by
SPIE

Volume 7403

Proceedings of SPIE, 0277-786X, v. 7403

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 *Nanobiosystems: Processing, Characterization, and Applications II*, edited by Norihisa Kobayashi, Fahima Ouchen, Ileana Rau, Proceedings of SPIE Vol. 7403 (SPIE, Bellingham, WA, 2009) Article CID Number.

ISSN 0277-786X
ISBN 9780819476937

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. 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 features the word "SPIE" in a bold, sans-serif font above the words "Digital Library" in a similar font. To the right of the text is a stylized graphic consisting of three vertical bars of increasing height, resembling a bar chart or a digital signal.

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 *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)

SESSION 1 MULTIFUNCTIONAL MATERIALS

- 7403 03 **Customized multiphotonics nanotools for bioapplications: soft organic nanodots as an eco-friendly alternative to quantum dots (Invited Paper) [7403-02]**
O. Mongin, C. Rouxel, J.-M. Vabre, Y. Mir, Chimie et Photonic Moléculaires, CNRS, Univ. de Rennes 1 (France); A. Pla-Quintana, Y. Wei, A.-M. Caminade, J.-P. Majoral, Lab. de Chimie de Coordination, CNRS (France); M. Blanchard-Desce, Chimie et Photonic Moléculaires, CNRS, Univ. de Rennes 1 (France)
- 7403 04 **Bio-inspired photo-electronic material based on photosynthetic proteins [7403-03]**
N. Lebedev, S. A. Trammell, S. Tsoi, Naval Research Lab. (United States); A. Spano, Univ. of Virginia (United States); J. H. Kim, J. Xu, Brown Univ. (United States); M. E. Twigg, Naval Research Lab. (United States); J. M. Schnur, George Mason Univ. (United States)

SESSION 2 DNA APPLICATIONS I

- 7403 05 **Novel applications of DNA materials (Invited Paper) [7403-04]**
N. Ogata, K. Yamaoka, Ogata Research Lab., Ltd. (Japan); J. Yoshida, Chitose Institute of Science and Technology (Japan)
- 7403 08 **Biomaterials based on DNA embedded in silica matrix [7403-07]**
M. Mihaly, A. Comanescu, Univ. Politehnica Bucharest (Romania); A. Rogozea, Ilie Murgulescu Institute of Physical Chemistry (Romania); C. Pirvu, I. Rau, Univ. Politehnica Bucharest (Romania)

SESSION 3 DNA APPLICATIONS II

- 7403 0A **Dielectric and electrical properties of sol-gel/DNA blends (Invited Paper) [7403-09]**
R. A. Norwood, C. T. DeRose, R. Himmelhuber, N. Peyghambarian, College of Optical Sciences, The Univ. of Arizona (United States); J. Wang, L. Li, TIPD, LLC (United States); F. Ouchen, J. G. Grote, Air Force Research Lab. (United States)
- 7403 0B **Photoconductivity and current-voltage characteristics of thin DNA films: experiments and modeling [7403-10]**
R. Venkatramani, Duke Univ. (United States); D. Y. Zang, C. Oh, IPITEK, Inc. (United States); J. Grote, Air Force Research Lab. (United States); D. Beratan, Duke Univ. (United States)

- 7403 0C **Gating of single layer graphene using DNA** [7403-11]
J. Lin, D. Teweldebrhan, K. Ashraf, G. Liu, X. Jing, Z. Yan, R. Li, R. K. Lake, M. Ozkan,
A. A. Balandin, C. S. Ozkan, Univ. of California, Riverside (United States)

SESSION 4 DNA APPLICATIONS III

- 7403 0D **Stretching of (DNA/functional molecules) complex between electrodes towards DNA molecular wire (Invited Paper)** [7403-12]
N. Kobayashi, M. Nishizawa, S. Inoue, K. Nakamura, Chiba Univ. (Japan)
- 7403 0F **DNA thin films as semiconductors for BioFET** [7403-14]
F. Ouchen, Air Force Research Lab. (United States); P. P. Yaney, Air Force Research Lab. (United States) and Univ. of Dayton (United States); J. G. Grote, Air Force Research Lab. (United States)

SESSION 5 NANOBIOSYSTEMS

- 7403 0H **Hyperbranched polysiloxysilane nanoparticles for nonviral gene delivery vectors and nanoprobes (Invited Paper)** [7403-16]
W. J. Kim, Hannam Univ. (Korea, Republic of) and Univ. at Buffalo (United States);
A. C. Bonoiu, Univ. at Buffalo (United States); K.-S. Lee, Hannam Univ. (Korea, Republic of);
T. Hayakawa, C. Xia, M. Kakimoto, Tokyo Institute of Technology (Japan); H. E. Pudavar,
P. N. Prasad, Univ. at Buffalo (United States)
- 7403 0K **Synthesis and characterization of nano spherical hydroxyapatite for drug delivery and tissue engineering** [7403-21]
P. M. S. L. Shanthi, M. Ashok, T. Balasubramanian, National Institute of Technology,
Tiruchirappalli (India); A. P. Uthirakumar, Chonbuk National Univ. (India)

SESSION 6 DNA PHOTONICS

- 7403 0M **Characterization of polymer, DNA-based, and silk thin film resistivities and of DNA-based films prepared for enhanced electrical conductivity (Invited Paper)** [7403-24]
P. P. Yaney, Univ. of Dayton (United States) and Air Force Research Lab. (United States);
F. Ouchen, J. G. Grote, Air Force Research Lab. (United States)

SESSION 7 NONLINEAR OPTICAL PROPERTIES

- 7403 0N **Nonlinear optical characterization in a degenerate multi-wave mixing configuration (Invited Paper)** [7403-25]
G. Boudebs, K. Fedus, Univ. d'Angers (France)
- 7403 0O **Frequency-time distribution of a spontaneous photon emitted by two level atom in one-dimensional damped nanocavity with a single resonance mode (Invited Paper)** [7403-26]
V. Cheltsov, Moscow State Mining Univ. (Russian Federation)

- 7403 OP **Nonlinear optical properties of photoswitchable fluorescent proteins** [7403-27]
I. Asselberghs, C. Flors, Katholieke Univ. Leuven (Belgium); E. De Meulenaere, Katholieke Univ. Leuven (Belgium) and Univ. of Leuven (Belgium); B. Champagne, Lab de Chimie Théorique Appliquée, Univ. Notre-Dame de la Paix (Belgium); J. Vanderleyden, Univ. of Leuven (Belgium); K. Clays, Katholieke Univ. Leuven (Belgium)

POSTER SESSION

- 7403 OQ **New nanobiomaterials based on irridoidic compounds** [7403-28]
N. Radu, C. Corobea, Institutul National de Cercetare (Romania); I. Rau, Univ. Politehnica of Bucharest (Romania)
- 7403 OR **Biological properties of nanomaterials based on irridoidic compounds** [7403-29]
N. Radu, Institutul National de Cercetare (Romania); I. G. Cristescu, Carol Davila Univ. of Medicine and Pharmacy (Romania); D. Coprean, Univ. Ovidius Constanta (Romania); I. Rau, Univ. Politehnica of Bucharest (Romania)

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

Norihisa Kobayashi, Chiba University (Japan)
Fahima Ouchen, Air Force Research Laboratory (United States)
Ileana Rau, Polytechnic University of Bucharest (Romania)

Program Committee

Carrie M. Bartsch, General Dynamics Information Technology
(United States)
Liming Dai, University of Dayton (United States)
Ananth Dodabalapur, The University of Texas at Austin (United States)
James G. Grote, Air Force Research Laboratory (United States)
Emily M. Heckman, General Dynamics Information Technology
(United States)
Kuniharu Ijiro, Hokkaido University (Japan)
Jung-Il Jin, Korea University (Korea, Republic of)
François Kajzar, Université d'Angers (France)
Sang Kim, Air Force Research Laboratory (United States)
Norihisa Kobayashi, Chiba University (Japan)
Oksana Krupka, Université d'Angers (France)
Charles Y. C. Lee, Air Force Office of Scientific Research (United States)
Misoon Mah, Asian Office of Aerospace Research and Development
(Japan)
Naoya Ogata, Chitose Institute of Science and Technology (Japan)
Bruce H. Robinson, University of Washington (United States)
Anna Samoc, The Australian National University (Australia)
Marek J. Samoc, The Australian National University (Australia)
Niyazi Serdar Sariciftci, Johannes Kepler University Linz (Austria)
Kristi M. Singh, Air Force Research Laboratory (United States)
Andrew J. Steckl, University of Cincinnati (United States)
Morley O. Stone, Air Force Research Laboratory (United States)
Perry P. Yaney, University of Dayton (United States)

Session Chairs

- 1 Multifunctional Materials
Ileana Rau, Polytechnical University of Bucharest (Romania)
- 2 DNA Applications I
Mireille H. Blanchard-Desce, Université de Rennes I (France)
- 3 DNA Applications II
Norihisa Kobayashi, Chiba University (Japan)
- 4 DNA Applications III
Robert A. Norwood, College of Optical Sciences, The University of Arizona (United States)
- 5 Nanobiosystems
Fahima Ouchen, Air Force Research Laboratory (United States)
- 6 DNA Photonics
Kwang-Sup Lee, Hannam University (Korea, Republic of)
- 7 Nonlinear Optical Properties
Norihisa Kobayashi, Chiba University (Japan)