PROCEEDINGS OF SPIE

SPIDigitalLibrary.org/conference-proceedings-of-spie

Front Matter: Volume 6866

, "Front Matter: Volume 6866," Proc. SPIE 6866, Colloidal Quantum Dots for Biomedical Applications III, 686601 (13 March 2008); doi: 10.1117/12.792472

SPIE.

Event: SPIE BiOS, 2008, San Jose, California, United States

PROGRESS IN BIOMEDICAL OPTICS AND IMAGING

Vol. 9, No. 25

Colloidal Quantum Dots for Biomedical Applications III

**Marek Osiński
Thomas M. Jovin
Kenji Yamamoto**
Editors

**19–21 January 2008
San Jose, California, USA**

Sponsored and Published by
SPIE

Volume 6866

Proceedings of SPIE, 1605-7422, v. 6866

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 *Colloidal Quantum Dots for Biomedical Applications III*, edited by Marek Osiński, Thomas M. Jovin, Kenji Yamamoto, Proceedings of SPIE Vol. 6866 (SPIE, Bellingham, WA, 2008) Article CID Number.

ISSN 1605-7422

ISBN 9780819470416

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 1605-7422/08/\$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 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*

SYNTHESIS AND CHARACTERIZATION OF NANOCRYSTALS FOR BIOMEDICAL APPLICATIONS

- 6866 02 **Synthesis and applications of quantum dots and magnetic quantum dots (Invited Paper)** [6866-01]
J. Y. Ying, Y. Zheng, S. T. Selvan, Institute of Bioengineering and Nanotechnology (Singapore)
- 6866 03 **Synthesis and functionalization of non-toxic visible-emitting nanocrystals (Invited Paper)** [6866-02]
Y. Chen, L. Page, R. Thakar, P. T. Snee, Univ. of Illinois at Chicago (USA)
- 6866 04 **Synthesis and characterization of scintillating lead-iodide-based nanocrystals** [6866-03]
K. Sankar, B. A. Akins, T. A. Memon, N. J. Withers, G. A. Smolyakov, M. Osiński, Ctr. for High Technology Materials, Univ. of New Mexico (USA)

BIOFUNCTIONALIZATION OF COLLOIDAL NANOCRYSTALS

- 6866 06 **New ligand design to promote water compatibility of luminescent quantum dots and gold nanoparticles** [6866-06]
B. C. Mei, Naval Research Lab. (USA) and Univ. of Massachusetts, Amherst (USA);
K. Susumu, Naval Research Lab. (USA); I. L. Medintz, J. B. Delehanty, H. Mattoussi, Naval Research Lab. (USA)
- 6866 07 **Development and characterization of silk fibroin coated quantum dots** [6866-07]
B. B. Nathwani, M.D. Anderson Cancer Ctr. (USA) and Texas A&M Univ. (USA);
C. Needham, Texas A&M Univ. (USA); A. B. Mathur, M.D. Anderson Cancer Ctr. (USA);
K. E. Meissner, Texas A&M Univ. (USA)

RESONANT-ENERGY-TRANSFER-BASED NANOSENSING

- 6866 0B **Assembly and intracellular delivery of quantum dot-fluorescent protein bioconjugates** [6866-10]
I. L. Medintz, T. Pons, J. B. Delehanty, K. Susumu, Naval Research Lab. (USA); P. E. Dawson, The Scripps Research Institute (USA); H. Mattoussi, Naval Research Lab. (USA)
- 6866 0C **Förster resonance energy transfer (FRET) between a fluorescent protein and commercially available quantum dots: a comparison** [6866-11]
A. M. Dennis, G. Bao, Georgia Institute of Technology (USA) and Emory Univ. (USA)

APPLICATIONS OF COLLOIDAL NANOCRYSTALS IN CELL BIOLOGY I

- 6866 OI **Quantum dots-based probes conjugated to Annexin V for photostable apoptosis detection and imaging (Invited Paper)** [6866-39]
S. Le Gac, Univ. of Twente (Netherlands); I. Vermes, Medisch Spectrum Twente (Netherlands); A. van den Berg, Univ. of Twente (Netherlands)
- 6866 OJ **The relationship of QD composition and conjugate to cellular uptake and toxicity** [6866-17]
J. L. Nadeau, S. J. Clarke, A. K. Suresh, R. A. Khatchadourian, E.-M. Dumas, McGill Univ. (Canada)
- 6866 OK **Specific cellular delivery and intracellular fate of quantum dot-peptide and quantum dot-polymer nanoassemblies** [6866-18]
J. B. Delehanty, C. E. Bradburne, I. L. Medintz, D. Farrell, T. Pons, Naval Research Lab. (USA); F. M. Brunel, P. E. Dawson, The Scripps Research Institute (USA); H. Mattoussi, Naval Research Lab. (USA)
- 6866 OL **Bioactivation of water-soluble peptidic quantum dot through biotin-streptavidin binding** [6866-19]
A. Dif, S. Touchet, S. Nagarajan, M. Baudy-Floc'h, Univ. Rennes I (France); M. Dahan, Ecole Normale Supérieure (France); J. Piehler, Goethe-Univ. Frankfurt am Main (Germany); V. Marchi-Artzner, Univ. Rennes I (France)

APPLICATIONS OF COLLOIDAL NANOCRYSTALS IN CELL BIOLOGY II

- 6866 OP **Dynamics of quantum dots in angiogenic blood vessels: a fluorescence correlation spectroscopy study (Invited Paper)** [6866-38]
A. A. Clancy, D. T. Cramb, Univ. of Calgary (Canada)

APPLICATIONS OF COLLOIDAL QUANTUM DOTS IN CANCER DIAGNOSTICS AND THERAPY

- 6866 OR **EGF-conjugated near-infrared quantum dots as nanoprobes for in-vivo imaging of EGFR expression** [6866-24]
P. Diagaradjane, J. M. Orenstein-Cardona, N. E. Colón-Casasnovas, A. Deorukhkar, S. Shentu, N. Kuno, D. L. Schwartz, J. G. Gelovani, S. Krishnan, The Univ. of Texas M.D. Anderson Cancer Ctr. (USA)
- 6866 OS **Peptide targeting of quantum dots to human breast cancer cells** [6866-25]
E. M. Haglund, M.-M. Seale-Goldsmith, D. Dhawan, J. Stewart, J. Ramos-Vara, C. L. Cooper, L. M. Reece, T. Husk, D. Bergstrom, D. Knapp, J. F. Leary, Purdue Univ. (USA)
- 6866 OT **Use of quantum dot-conjugated antibodies to study intracellular cancer biomarkers in living and fixed cells** [6866-26]
J. Ling, Southwest Research Institute (USA)

APPLICATIONS OF COLLOIDAL QUANTUM DOTS IN NEUROSCIENCE AND RADIATION DETECTION

- 6866 0V **Optimizing protocols for imaging neural cells and tissues using functionalized quantum dots (Invited Paper)** [6866-28]
S. Pathak, G. A. Silva, Univ. of California, San Diego (USA)
- 6866 0X **Targeting the human serotonin transporter (hSERT) with quantum dots** [6866-30]
I. D. Tomlinson, J. Chang, Vanderbilt Univ. (USA); H. Iwamoto, L. J. De Felice, R. D. Blakely, Vanderbilt Univ. School of Medicine (USA); S. J. Rosenthal, Vanderbilt Univ. (USA) and Vanderbilt Univ. School of Medicine (USA)

POSTER SESSION

- 6866 0Z **Two-photon properties of CdSe core ZnS/CdS multishell quantum dots for bioimaging applications** [6866-32]
Y. Liu, P. Chen, L. Lin, G. Q. Tang, G. G. Mu, Nankai Univ. (China)
- 6866 10 **Development of surface-enhanced Raman scattering (SERS) substrates using nanoparticle-based printing inks** [6866-33]
M. A. Figueroa, School of Biomedical Engineering, Sciences, and Health Systems, Drexel Univ. (USA); S. Park, Drexel Univ. (USA); K. Pourrezaei, School of Biomedical Engineering, Sciences, and Health Systems, Drexel Univ. (USA); S. Tyagi, Drexel Univ. (USA)
- 6866 13 **Evidence-based toxicity of probes** [6866-36]
K. Fujioka, International Medical Ctr. of Japan (Japan); M. Hiruoka, K. Sato, Tokyo Denki Univ. (Japan); N. Manabe, A. Hoshino, International Medical Ctr. of Japan (Japan); K. Hirakuri, Tokyo Denki Univ. (Japan); K. Yamamoto, International Medical Ctr. of Japan (Japan)

Author Index

Conference Committee

Symposium Chairs

James Fujimoto, Massachusetts Institute of Technology (USA)
R. Rox Anderson, Wellman Center for Photomedicine, Massachusetts General Hospital (USA) and Harvard School of Medicine (USA)

Program Track Chairs

Paras N. Prasad, University at Buffalo (USA)
Dan V. Nicolau, The University of Liverpool (United Kingdom)

Conference Chairs

Marek Osinski, Center for High Technology Materials, The University of New Mexico (USA)
Thomas M. Jovin, Max-Planck-Institut für biophysikalische Chemie (Germany)
Kenji Yamamoto, Tokyo Medical and Dental University Graduate School of Medicine (Japan) and International Medical Center of Japan (Japan)

Program Committee

Antigoni Alexandrou, École Polytechnique (France)
Moungi G. Bawendi, Massachusetts Institute of Technology (USA)
Maxime Dahan, Laboratoire Kastler Brossel, Ecole Normale Supérieure (France)
Alexander Eychmüller, Technische Universität Dresden (Germany)
Jennifer A. Hollingsworth, Los Alamos National Laboratory (USA)
Hedi Mattoussi, Naval Research Laboratory (USA)
Paul Mulvaney, The University of Melbourne (Australia)
Jay L. Nadeau, McGill University (Canada)
Shuming Nie, Georgia Institute of Technology (USA) and Emory University (USA)
Wolfgang J. Parak, Philipps-Universität Marburg (Germany)
Sandra J. Rosenthal, Vanderbilt University (USA)
Tania Q. Vu, Oregon Health & Science University (USA)
Michael S. Wong, Rice University (USA)

Session Chairs

- 1 Synthesis and Characterization of Nanocrystals for Biomedical Applications
 Geoffrey F. Strouse, Florida State University (USA)
- 2 Biofunctionalization of Colloidal Nanocrystals
 Jay L. Nadeau, McGill University (Canada)
- 3 Resonant-Energy-Transfer-Based Nanosensing
 Jennifer A. Hollingsworth, Los Alamos National Laboratory (USA)
- 4 Molecular-Level Sensing and Imaging with Nanoparticles
 Wolfgang J. Parak, Philipps-Universität Marburg (Germany)
- 5 Applications of Colloidal Nanocrystals in Cell Biology I
 Nikolay Klassen, Institute of Solid State Physics (Russia)
- 6 Applications of Colloidal Nanocrystals in Cell Biology II
 Igor L. Medintz, Naval Research Laboratory (USA)
- 7 Applications of Colloidal Quantum Dots in Cancer Diagnostics and Therapy
 Kenji Yamamoto, Tokyo Medical and Dental University Graduate School of Medicine (Japan) and International Medical Center of Japan (Japan)
- 8 Applications of Colloidal Quantum Dots in Neuroscience and Radiation Detection
 Tania Q. Vu, Oregon Health & Science University (USA)