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:


ISSN: 0277-786X
ISBN: 9781628410440

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.

SPIEDigitalLibrary.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

ADVANCES IN FIBER OPTIC SENSING FOR BIOMEDICAL APPLICATIONS

9107 04 Low drift and high resolution miniature optical fiber combined pressure- and temperature sensor for cardio-vascular and urodynamic applications [9107-4]  
S. Poeggel, D. Tosi, D. Duraibabu, Univ. of Limerick (Ireland); S. Sannino, L. Lupoli, J. Ippolito, F. Fusco, V. Mirone, Univ. degli Studi di Napoli Federico II (Italy); G. Leen, E. Lewis, Univ. of Limerick (Ireland)

RAMAN/SERS FOR BIOMEDICAL SENSING

9107 08 Characterization of ultrathin oxide-based multilayer SERS nanoprobes for intracellular sensing [9107-8]  
P. Strobbia, B. M. Cullum, Univ. of Maryland, Baltimore County (United States)

9107 09 Detection of illicit drugs in impaired driver saliva by a field-usable SERS analyzer [9107-9]  
C. Shende, H. Huang, S. Farquharson, Real-Time Analyzers, Inc. (United States)

9107 0A Rapid detection of Pseudomonas aeruginosa biomarkers in biological fluids using surface-enhanced Raman scattering [9107-10]  
X. Wu, J. Chen, Y. Zhao, The Univ. of Georgia (United States); S. M. Zughai, Emory Univ. School of Medicine (United States)

IMAGING FOR BIOMEDICAL APPLICATIONS

9107 0B Measurement of hearing loss due to perforated tympanic membrane using image processing techniques [9107-11]  
N. Sardesai, Univ. of Maryland, Baltimore County (United States); R. Sardesai, Jehangir Hospital (India); C.-I. Chang, Univ. of Maryland, Baltimore County (United States)

9107 0C Quantitative analysis of low contrast detectability in optical coherence tomography [9107-12]  
N. Woolsey, H.-W. Wang, Univ. of Maryland, College Park (United States) and U.S. Food and Drug Administration (United States); A. Agrawal, U.S. Food and Drug Administration (United States); J. Wang, Univ. of Maryland, College Park (United States) and U.S. Food and Drug Administration (United States); C.-P. Liang, Y. Chen, Univ. of Maryland, College Park (United States); J. Pfefer, U.S. Food and Drug Administration (United States)
MICRO/NANOFLUIDIC FOR BIOMEDICAL SENSING AND TREATMENT

9107 0H Transient flow with memory in a nanocapillar [9107-17]
M. Pineda Osorio, Univ. EAFIT (Colombia)

9107 0I Characteristic impedance of a microchannel with two immiscible microfluids [9107-18]
D. Jaramillo Raquejo, Univ. EAFIT (Colombia)

9107 0J Microfluidic preparation of radiopharmaceuticals for use in imaging studies [9107-19]
T. L. Collier, Advion, Inc. (United States)

9107 0K Generalized electroosmosis transport with a spatially modulated electric permittivity inside a cylindrical micro channel [9107-20]
J. J. Cadavid Muñoz, Univ. EAFIT (Colombia)

9107 0L Nanofluidic structures for coupled sensing and remediation of toxins [9107-21]
K. Shaw, N. M. Contento, W. Xu, P. W. Bohn, Univ. of Notre Dame (United States)

LAB-ON-A-CHIP TECHNOLOGIES FOR BIOSENSING APPLICATIONS

9107 0M Thermal effects in microfluidics with thermal conductivity spatially modulated [9107-22]
A. Vargas Toro, Univ. EAFIT (Colombia)

9107 0N Using Lambert W function and error function to model phase change on microfluidics [9107-23]
A. Bermudez Garcia, Univ. EAFIT (Colombia)

9107 0O Lab-on-a-chip PCR: real time PCR in miniaturized format for HLA diagnostics [9107-24]
C. Gaertner, H. Becker, N. Hlawatsch, R. Klemm, C. Moche, R. Sewart, microfluidic ChipShop GmbH (Germany); R. Frank, A. Willems, Inno-train Diagnostik GmbH (Germany)

9107 0P Fluorescence detection in Lab-on-a-chip systems using ultrafast nucleic acid amplification methods [9107-25]
R. Gransee, Fraunhofer ICT-IMM (Germany); T. Schneider, Univ. of Applied Sciences, Wiesbaden Ruesselsheim (Germany); D. Elyorgun, Univ. of Applied Sciences Bingen (Germany); X. Strobach, T. Schunck, T. Gatscha, J. Höth, Fraunhofer ICT-IMM (Germany)

9107 0R Lab-on-a-chip modules for detection of highly pathogenic bacteria: from sample preparation to detection [9107-27]
S. Julich, Friedrich-Loeffler-Institut (Germany); R. Kopinč, Institute of Microbial Sciences and Technologies (Slovenia) and Institute of Metagenomics and Microbial Technologies (Slovenia); N. Hlawatsch, C. Moche, microfluidic ChipShop GmbH (Germany); A. Lapanje, Institute of Microbial Sciences and Technologies (Slovenia); C. Gärtner, microfluidic ChipShop GmbH (Germany); H. Tomaso, Friedrich-Loeffler-Institut (Germany)
Zinc oxide nanostructures for electrochemical cortisol biosensing [9107-30]
P. K. Vabbina, A. Kaushik, K. Tracy, S. Bhansali, N. Pala, Florida International Univ. (United States)

Xanthine oxidase biosensor for monitoring meat spoilage [9107-31]
D. C. Vanegas, Univ. of Florida (United States) and Univ. del Valle (Colombia); C. Gomes, Texas A&M Univ. (United States); E. S. McLamore, Univ. of Florida (United States)

Evaluation of thiazole intercalating dyes as acceptors for quantum dot donors in Förster resonance energy transfer (Invited Paper) [9107-32]
M. Massey, W. R. Algar, The Univ. of British Columbia (Canada)

FRET based characterization of DNA-based assemblies (Invited Paper) [9107-34]
S. Buckhout-White, George Mason Univ. (United States) and U.S. Naval Research Lab. (United States); R. Gray, M. Ancona, E. R. Goldman, I. L. Medintz, U.S. Naval Research Lab. (United States)

Biomolecular logic systems: applications to biosensors and bioactuators (Invited Paper) [9107-35]
E. Katz, Clarkson Univ. (United States)

Monitoring enzyme kinetic behavior of enzyme-quantum dot bioconjugates (Invited Paper) [9107-36]
J. C. Claussen, U.S. Naval Research Lab. (United States) and George Mason Univ. (United States); S. A. Walper, U.S. Naval Research Lab. (United States); K. Susumu, U.S. Naval Research Lab. (United States) and Sotera Defense Solutions (United States); M. G. Ancona, I. L. Medintz, U.S. Naval Research Lab. (United States)

Peptide-based protein capture agents with high affinity, selectivity, and stability as antibody replacements in biodetection assays [9107-37]
M. B. Coppock, U.S. Army Research Lab. (United States); B. Farrow, California Institute of Technology (United States); C. Warner, Edgewood Chemical Biological Ctr. (United States); A. S. Finch, U.S. Army Research Lab. (United States); B. Lai, Indi Molecular (United States); D. A. Sarkes, U.S. Army Research Lab. (United States); J. R. Heath, California Institute of Technology (United States); D. Stratis-Cullum, U.S. Army Research Lab. (United States)

PPy/PMMA/PEG-based sensor for low-concentration acetone detection [9107-38]
A. Daneshkhah, S. Shrestha, M. Agarwal, K. Varahramyan, Indiana Univ.-Purdue Univ. Indianapolis (United States)
BIOSENSING AND THERAPY FOR THE CENTRAL NERVOUS SYSTEM

9107 16 Control channels in the brain and their influence on brain executive functions [9107-42]
Q. Meng, F.-S. Choa, Univ. of Maryland, Baltimore County (United States); E. Hong, Univ. of Maryland School of Medicine (United States); Z. Wang, M. Islam, Univ. of Maryland, Baltimore County (United States)

9107 17 Rehabilitation and motor learning through vibrotactile feedback [9107-43]
R. Panchanathan, Univ. of California, Berkeley (United States) and Arizona State Univ. (United States); J. Rosenthal, HeatSync Labs. (United States); T. McDaniel, Arizona State Univ. (United States)

OPTICAL BIOPSY AND PHOTOACOUSTIC SENSING/BIOIMAGING

9107 18 Dynamic tissue phantoms and their use in assessment of a noninvasive optical plethysmography imaging device [9107-44]
J. E. Thatcher, K. D. Plant, D. R. King, Spectral MD, Inc. (United States); K. L. Block, Spectral MD, Inc. (United States) and Ken Block Consulting (United States); W. Fan, J. M. DiMaio, Spectral MD, Inc. (United States)

9107 19 Characterization of tissue-simulating polymers for photoacoustic vascular imaging [9107-45]
W. C. Vogt, C. Jia, B. S. Garra, T. J. Pfefer, U.S. Food and Drug Administration (United States)

9107 1B High-resolution all-optical photoacoustic imaging system for remote interrogation of biological specimens [9107-47]
A. Sampathkumar, Riverside Research Institute (United States)

MODELING DRUG DELIVERY APPROACHES

9107 1C Analytical solution for the diffusion model of transdermal patches [9107-50]
F. Díaz, Univ. EAFIT (Colombia)

9107 1D Spherical drug delivery device with a radial modulated diffusivity with lateral discharge through a thin ring [9107-48]
N. A. Gutierrez A., Univ. EAFIT (Colombia)

9107 1E Analytical solution of a model for shrinking drug-loaded microspheres [9107-49]
D. Bolaños, Univ. EAFIT (Colombia)

9107 1F Drug diffusion across skin with diffusivity spatially modulated [9107-51]
I. Montoya Arroyave, Univ. EAFIT (Colombia)

Author Index
Conference Committee

Symposium Chair

David A. Whelan, Boeing Defense, Space, and Security (United States)

Symposium Co-chair

Wolfgang Schade, Technische Universität Clausthal (Germany) and Fraunhofer Heinrich-Hertz-Institut (Germany)

Conference Chairs

Brian M. Cullum, University of Maryland, Baltimore County (United States)
Eric S. McLamore, University of Florida (United States)

Conference Program Committee

Troy A. Alexander, U.S. Army Research Laboratory (United States)
Christopher Anton, Episensors, Inc. (United States)
Karl S. Books, University of Delaware (United States)
Jonathan C. Claussen, U.S. Naval Research Laboratory (United States)
Amethist S. Finch, U.S. Army Research Laboratory (United States)
Claudia Gärtner, microfluidic ChipShop GmbH (Germany)
Christopher D. Geddes, University of Maryland, Baltimore (United States)
Ilko K. Ilev, U.S. Food and Drug Administration (United States)
Douglas Kiehl, Eli Lilly and Company (United States)
Nicole Y. Morgan, NIBIB/National Institutes of Health (United States)
T. Joshua Pfefer, U.S. Food and Drug Administration (United States)
Marcin Ptaszek, University of Maryland, Baltimore County (United States)
Noriko Satake, UC Davis Medical Center (United States)
Shiv K. Sharma, University of Hawaii at Manoa (United States)
Narsingh B. Singh, University of Maryland, Baltimore County (United States)
Ryan J. White, University of Maryland, Baltimore County (United States)
Session Chairs

1      Advances in Fiber Optic Sensing for Biomedical Applications
Ilko K. Ilev, U.S. Food and Drug Administration (United States)
Brian M. Cullum, University of Maryland, Baltimore County
(United States)

2      Raman/SERS for Biomedical Sensing
Brian M. Cullum, University of Maryland, Baltimore County
(United States)
Shiv K. Sharma, University of Hawai'i at Manoa (United States)

3      Imaging for Biomedical Applications
Narsingh B. Singh, University of Maryland, Baltimore County
(United States)
Brian M. Cullum, University of Maryland, Baltimore County
(United States)

4      Micro/Nanofluidic for Biomedical Sensing and Treatment
Douglas Kiehl, Eli Lilly and Company (United States)
Claudia Gärtner, microfluidic ChipShop GmbH (Germany)

5      Lab-on-a-Chip Technologies for Biosensing Applications
Claudia Gärtner, microfluidic ChipShop GmbH (Germany)
Douglas Kiehl, Eli Lilly and Company (United States)

6      Advances in Electrochemical Biosensing Materials and Devices
Ryan J. White, University of Maryland, Baltimore County
(United States)
Eric S. McLamore, University of Florida (United States)

7      Innovations in Multimodal Molecular Probes: Joint Session with
Conferences 9083 and 9107
Antonio Sastre, National Institutes of Health (United States)
Richard Conroy, National Institutes of Health (United States)

8      Advances in Luminescent Biosensing and Biomolecular Logic
Jonathan C. Claussen, U.S. Naval Research Laboratory
(United States)
Amethist S. Finch, U.S. Army Research Laboratory (United States)

9      Advanced Smart Materials for Potential Biosensing/Bioimaging
Applications
Amethist S. Finch, U.S. Army Research Laboratory (United States)
Jonathan C. Claussen, U.S. Naval Research Laboratory
(United States)
10  Biosensing and Therapy for the Central Nervous System  
Noriko Satake, UC Davis Medical Center (United States)  
Brian M. Cullum, University of Maryland, Baltimore County  
(United States)

11  Optical Biopsy and Photoacoustic Sensing/Bioimaging  
Joshua Pfefer, U.S. Food and Drug Administration (United States)  
Brian M. Cullum, University of Maryland, Baltimore County  
(United States)

12  Modeling Drug Delivery Approaches  
Eric S. McLamore, University of Florida (United States)  
Douglas Kiehl, Eli Lilly and Company (United States)