

PROGRESS IN BIOMEDICAL OPTICS AND IMAGING

Vol. 11, No. 13

# ***Biomedical Vibrational Spectroscopy IV: Advances in Research and Industry***

**Anita Mahadevan-Jansen**

**Wolfgang Petrich**

*Editors*

**23–25 January 2010**

**San Francisco, California, United States**

*Sponsored and Published by*

SPIE

**Volume 7560**

Proceedings of SPIE, 1605-7422, v. 7560

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 *Biomedical Vibrational Spectroscopy IV: Advances in Research and Industry*, edited by Anita Mahadevan-Jansen, Wolfgang Petrich, Proceedings of SPIE Vol. 7560 (SPIE, Bellingham, WA, 2010) Article CID Number.

ISSN 1605-7422

ISBN 9780819479563

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 © 2010, 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 1605-7422/10/\$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 smaller, lighter 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 signal waveform.

[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*

---

## SESSION 1 RAMAN SPECTROSCOPY AND CANCER

---

- 7560 02 **How specific Raman spectroscopic models are: a comparative study between different cancers** [7560-03]  
S. P. Singh, Advanced Ctr. for Treatment Research and Education in Cancer (India); K. K. Kumar, M. V. P. Chowdary, K. Maheedhar, Manipal Univ. (India); C. M. Krishna, Advanced Ctr. for Treatment Research and Education in Cancer (India)
- 7560 03 **In vivo Raman spectroscopy integrated with multimodal endoscopic imaging for early diagnosis of gastric dysplasia** [7560-11]  
M. S. Bergholt, W. Zheng, K. Lin, National Univ. of Singapore (Singapore); K. Y. Ho, M. Teh, National Univ. of Singapore (Singapore) and National Univ. Hospital System (Singapore); K. G. Yeoh, Z. Huang, National Univ. of Singapore (Singapore)
- 7560 05 **In vivo diagnosis of mammary adenocarcinoma using Raman spectroscopy: an animal model study** [7560-02]  
R. A. Bitar, Univ. Federal do ABC (Brazil); D. G. Ribeiro, E. A. P. dos Santos, Univ. do Vale do Paraíba (Brazil); L. N. Z. Ramalho, F. S. Ramalho, Univ. de São Paulo (Brazil); A. A. Martin, Univ. do Vale do Paraíba (Brazil); H. S. Martinho, Univ. Federal do ABC (Brazil)
- 7560 07 **FTIR, Raman, and CARS microscopic imaging for histopathologic assessment of brain tumors** [7560-26]  
C. Krafft, N. Bergner, C. Matthäus, IPHT Jena (Germany); B. Romeike, R. Reichart, R. Kalff, Friedrich-Schiller-Univ. Hospital Jena (Germany); B. Dietzek, J. Popp, IPHT Jena (Germany) and Friedrich-Schiller-Univ. Jena (Germany)

---

## SESSION 2 RAMAN SPECTROSCOPY AND CELLS

---

- 7560 08 **In situ cell cycle phase determination using Raman spectroscopy** [7560-05]  
Y. Oshima, Aoyama Gakuin Univ. (Japan) and RIKEN (Japan); T. Takenaka, Aoyama Gakuin Univ. (Japan); H. Sato, RIKEN (Japan) and Kwansai Gakuin Univ. (Japan); C. Furihata, Aoyama Gakuin Univ. (Japan)
- 7560 09 **A system for the rapid detection of bacterial contamination in cell-based therapeutics** [7560-06]  
C. Bolwien, C. Erhardt, G. Sulz, Fraunhofer IPM (Germany); H. Thielecke, R. Johann, Fraunhofer IBMT (Germany); M. Pudlas, H. Mertsching, S. Koch, Fraunhofer IGB (Germany)
- 7560 0A **Surface enhanced Raman spectroscopy for urinary tract infection diagnosis and antibiogram** [7560-09]  
E. Kastanos, Univ. of Nicosia (Cyprus); K. Hadjigeorgiou, A. Kyriakides, C. Pitris, Univ. of Cyprus (Cyprus)

7560 OB **Raman spectroscopic characterization of single cells** [7560-28]  
J. Popp, Friedrich-Schiller-Univ. Jena (Germany) and IPHT Jena (Germany); S. Stöckel, S. Meisel, T. Bocklitz, W. Schumacher, M. Putsche, P. Rösch, Friedrich-Schiller-Univ. Jena (Germany)

7560 OC **Determination of HER2 amplification status in breast cancer cells using Raman spectroscopy** [7560-30]  
X. Bi, B. Rexer, C. L. Arteaga, M. Guo, M. Li, A. Mahadevan-Jansen, Vanderbilt Univ. (United States)

---

### SESSION 3 IR SPECTROSCOPY

---

7560 OD **Bird sexing by Fourier transform infrared spectroscopy** [7560-10]  
G. Steiner, Technische Univ. Dresden (Germany); T. Bartels, M.-E. Krautwald-Junghanns, Univ. Leipzig (Germany); E. Koch, Technische Univ. Dresden (Germany)

7560 OE **In vitro characteristics of a mid-infrared continuous glucose sensor** [7560-12]  
C. Herrmann, C. Vrančić, A. Fomichova, Kirchhoff Institute for Physics, Univ. of Heidelberg (Germany); N. Gretz, S. Hoecker, Univ. Medical Ctr. Mannheim (Germany); A. Pucci, W. Petrich, Kirchhoff Institute for Physics, Univ. of Heidelberg (Germany)

7560 OF **Simultaneous observation of ultrafast ligand dissociation and docking-site trapping in heme proteins using upconversion infrared spectroscopy** [7560-20]  
P. Nuernberger, K. F. Lee, A. Bonvalet, A. Alexandrou, M. H. Vos, M. Joffre, Lab. d'Optique et Biosciences, CNRS, Ecole Polytechnique (France) and Institut National de la Santé et de la Recherche Médicale (France)

---

### SESSION 4 RAMAN SPECTROSCOPY AND NON-CANCER APPLICATIONS

---

7560 OG **Evaluation of thyroid tissue by Raman spectroscopy** [7560-04]  
C. S. B. Teixeira, Univ. do Vale do Paraíba (Brazil); R. A. Bitar, Univ. Federal do ABC (Brazil); A. B. O. Santos, M. A. V. Kulcsar, C. U. M. Friguglietti, Univ. do Vale do Paraíba (Brazil); H. S. Marinho, Univ. Federal do ABC (Brazil); R. B. da Costa, A. A. Martin, Univ. do Vale do Paraíba (Brazil)

7560 OH **Detecting changes during pregnancy with Raman spectroscopy** [7560-18]  
E. Vargis, Vanderbilt Univ. (United States); K. Robertson, A. Al-Hendy, Meharry Medical College (United States); J. Reese, A. Mahadevan-Jansen, Vanderbilt Univ. (United States)

7560 OI **Near infrared Raman spectroscopic study of reactive gliosis and the glial scar in injured rat spinal cords** [7560-23]  
T. Saxena, B. Deng, Syracuse Univ. (United States); E. Lewis-Clark, K. Hoellger, SUNY Binghamton (United States); D. Stelzner, SUNY Upstate Medical Univ. (United States); J. Hasenwinkel, Syracuse Univ. (United States); J. Chaiken, SUNY Upstate Medical Univ. (United States)

7560 OJ **Label free investigation of biomolecules on the nanometer scale using tip-enhanced Raman spectroscopy** [7560-25]  
V. Deckert, Friedrich-Schiller-Univ. Jena (Germany) and IPHT Jena (Germany); T. Deckert-Gaudig, M. Richter, R. Treffer, X. Lin, IPHT Jena (Germany)

---

**SESSION 5 NEW STRATEGIES IN TECHNOLOGY**

---

- 7560 ON **Ultra-low spatial resolution Raman mapping using a novel fibre optic probe** [7560-29]  
J. Hutchings, C. Kendall, N. Shepherd, H. Barr, Gloucestershire Hospitals NHS Foundation Trust (United Kingdom); J. Day, Univ. of Bristol (United Kingdom); N. Stone, Gloucestershire Hospitals NHS Foundation Trust (United Kingdom)

---

**SESSION 6 NEW STRATEGIES IN ANALYSIS**

---

- 7560 OO **Optical fiber bundle coupling errors in Raman spectra: correction via data processing** [7560-15]  
K. A. Dooley, F. W. L. Esmonde-White, M. D. Morris, Univ. of Michigan (United States)
- 7560 OP **Direct noninvasive observation of near infrared photobleaching of autofluorescence in human volar side fingertips in vivo** [7560-24]  
B. Deng, C. Wright, E. Lewis-Clark, Syracuse Univ. (United States); G. Shaheen, LighTouch Medical, Inc. (United States); R. Geier, Syracuse Univ. (United States); J. Chaiken, LighTouch Medical, Inc. (United States) and Syracuse Univ. (United States)

---

**POSTER SESSION**

---

- 7560 OR **Influence of permanent magnetic field on dynamic aqueous glucose absorption** [7560-01]  
X. Zhang, C. M. Ting, W. Zhang, GlucoStats System Pte, Ltd. (Singapore); J. H. Yeo, Nanyang Technological Univ. (Singapore)
- 7560 OS **In vivo Raman spectroscopy of biochemical changes in human skin by cosmetic application** [7560-07]  
M. G. Tosato, E. P. dos Santos, R. de Souza Alves, L. Raniero, Univ. do Vale do Paraíba (Brazil); P. F. C. Menezes, O. Kruger, C. E. O. Paes, O Boticário Franchising (Brazil); A. A. Martin, Univ. do Vale do Paraíba (Brazil)
- 7560 OT **FT-IR microspectroscopy in rapid identification of bacteria in pure and mixed culture** [7560-13]  
I. Fontoura, R. Belo, K. Sakane, M. A. G. Cardoso, S. Khouri, M. Uehara, L. Raniero, A. A. Martin, Univ. do Vale do Paraíba (Brazil)
- 7560 OU **Detecting early stage pressure ulcer on dark skin using multispectral imager** [7560-27]  
D. Yi, L. Kong, S. Sprigle, F. Wang, C. Wang, F. Liu, A. Adibi, R. Tummala, Georgia Institute of Technology (United States)

*Author Index*



# Conference Committee

## *Symposium Chairs*

**James G. Fujimoto**, Massachusetts Institute of Technology (United States)

**R. Rox Anderson**, Wellman Center for Photomedicine, Massachusetts General Hospital (United States) and Harvard School of Medicine (United States)

## *Program Track Chairs*

**Tuan Vo-Dinh**, Duke University (United States)

**Anita Mahadevan-Jansen**, Vanderbilt University (United States)

## *Conference Chairs*

**Anita Mahadevan-Jansen**, Vanderbilt University (United States)

**Wolfgang Petrich**, Roche Diagnostics GmbH (Germany)

## *Program Committee*

**Andrew J. Berger**, University of Rochester (United States)

**Max Diem**, Northeastern University (United States)

**Airton Abrahão Martin**, Universidade do Vale do Paraíba (Brazil)

**Michael D. Morris**, University of Michigan (United States)

**Dieter Naumann**, Robert Koch-Institut (Germany)

**Jürgen Popp**, Institute of Photonic Technology Jena e.V. (Germany)

**Nicholas Stone**, Gloucestershire Royal Hospital (United Kingdom)

## *Session Chairs*

1 Raman Spectroscopy and Cancer  
**Anita Mahadevan-Jansen**, Vanderbilt University (United States)

2 Raman Spectroscopy and Cells  
**Andrew J. Berger**, University of Rochester (United States)

3 IR Spectroscopy  
**Airton Abrahão Martin**, Universidade do Vale do Paraíba (Brazil)

4 Raman Spectroscopy and Non-Cancer Applications  
**Jürgen Popp**, Institute of Photonic Technology Jena e.V. (Germany)

5 New Strategies in Technology  
**Wolfgang Petrich**, Roche Diagnostics GmbH (Germany)

- 6 New Strategies in Analysis  
**Nicholas Stone**, Gloucestershire Royal Hospital (United Kingdom)