

PROCEEDINGS OF SPIE

***Advanced Environmental,  
Chemical, and Biological  
Sensing Technologies V***

**Tuan Vo-Dinh  
Robert A. Lieberman  
Günter Gauglitz**  
*Editors*

**10–11 September 2007  
Boston, Massachusetts, USA**

*Sponsored and Published by*  
SPIE

**Volume 6755**

Proceedings of SPIE, 0277-786X, v. 6755

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 *Advanced Environmental, Chemical, and Biological Sensing Technologies V*, edited by Tuan Vo-Dinh, Robert A. Lieberman, Günter Gauglitz, Proceedings of SPIE Vol. 6755 (SPIE, Bellingham, WA, 2007) Article CID Number.

ISSN 0277-786X  
ISBN 9780819469151

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 © 2007, 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/07/\$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 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

v *Conference Committee*

---

## SESSION 1 CHEMICAL SENSING

---

- 6755 02 **Remote gas sensing with long wavelength DFB laser diodes** [6755-03]  
J. Koeth, M. Fischer, M. Legge, J. Seufert, R. Werner, nanoplus Nanosystems and Technologies GmbH (Germany)
- 6755 03 **Polymer waveguide sensor arrays for enhanced multichemical detection** [6755-01]  
S. R. Cordero, A. Low, D. Ruiz, R. A. Lieberman, Intelligent Optical Systems (USA)
- 6755 04 **A wireless sensor network for methane monitoring** [6755-02]  
J. Hayes, C. Slater, B. Kiernan, C. Dunphy, W. Guo, K.-T. Lau, D. Diamond, Dublin City Univ. (Ireland)
- 6755 05 **Simple and sensitive protein detection system using UV LEDs and liquid core waveguides** [6755-05]  
M. Belz, World Precision Instruments, Inc. (USA)

---

## SESSION 2 PHYSICAL SENSING

---

- 6755 07 **A fiber optic sensor for simultaneous temperature and saccharinity measurement** [6755-07]  
P. Lu, Q. Chen, Memorial Univ. of Newfoundland (Canada)
- 6755 08 **New-generation security network with synergistic IP sensors** [6755-34]  
I. Peshko, Univ. of Toronto at Mississauga (Canada)
- 6755 09 **Applications of rare-earth ion-doped crystals for temperature measurement** [6755-09]  
P. Kommidis, I. Kamma, B. R. Reddy, Alabama A&M Univ. (USA)
- 6755 0B **Hyperspectral imaging based procedures applied to bottom ash characterization** [6755-11]  
G. Bonifazi, S. Serranti, Sapienza, Univ. di Roma (Italy)

---

## SESSION 3 BIOLOGICAL SENSING

---

- 6755 0E **Full-field optical coherence tomography (OCT) and early alterations in chloroplast morphology** [6755-14]  
A. C. Boccara, ESPCI/UPMC, CNRS (France); R. De Paepe, Univ. Paris-Sud, CNRS (France); A. Dubois, ESPCI/UPMC, CNRS (France); M. Boccara, Univ. Pierre et Marie Curie (France)

- 6755 OH **Tracking SERS-active nanoprobe intracellular uptake for chemical and biological sensing** [6755-33]  
M. K. Gregas, F. Yan, J. Scaffidi, H.-N. Wang, C. Khoury, Y. Zhang, T. Vo-Dinh, Duke Univ. (USA)

---

**SESSION 4 ENVIRONMENTAL SENSING I**

---

- 6755 OJ **Continuous spectral measurement of backscattering in sea water** [6755-19]  
J. Zhou, A. Gilerson, I. Ioannou, B. Gross, F. Moshary, S. Ahmed, City College/CUNY (USA)
- 6755 OL **Autonomous field-deployable device for the measurement of phosphate in natural water** [6755-21]  
C. Slater, J. Cleary, C. M. McGraw, Dublin City Univ. (Ireland); W. S. Yerazunis, Mitsubishi Electric Research Labs. (USA); K.-T. Lau, D. Diamond, Dublin City Univ. (Ireland)

---

**SESSION 5 ENVIRONMENTAL SENSING II**

---

- 6755 OP **Detection of nitrite by flow injection analysis using a novel paired emitter-detector diode (PEDD) as a photometric detector** [6755-04]  
M. O'Toole, R. Shepherd, K.-T. Lau, D. Diamond, Dublin City Univ. (Ireland)

---

**SESSION 6 SENSOR COMPONENTS AND TECHNIQUES**

---

- 6755 OS **VAPI: low-cost rapid automated visual inspection system for Petri plate analysis** [6755-27]  
L. T. Chatburn, B. C. Kirkup, M. F. Polz, Massachusetts Institute of Technology (USA)
- 6755 OV **A smart cap for olive oil rancidity detection using optochemical sensors** [6755-31]  
A. G. Mignani, L. Ciaccheri, A. A. Mencaglia, CNR-IFAC (Italy); R. Paolesse, M. Mastroianni, D. Monti, Univ. di Roma Tor Vergata (Italy); G. Buonocore, CNR-IMCB (Italy); A. Del Nobile, A. Mentana, M. F. Grimaldi, Univ. di Foggia (Italy)

---

**POSTER SESSION**

---

- 6755 OW **Development and testing of a multiwell plates absorbance reader for clinical analysis using inexpensive webcam** [6755-17]  
J. Castillo, H. Gutierrez, Y. Vitta, M. Martinez, A. Fernandez, Escuela de Química Facultad de Ciencias (Venezuela)
- 6755 OX **Bio-sensing based on plasmon-coupling caused by rotated sub-micrometer gratings in metal-dielectric interfacial layers** [6755-32]  
M. Csete, Á. Sipos, A. Szalai, A. Mathesz, Univ. of Szeged (Hungary); M. A. Deli, Sz. Veszélka, Institute of Biophysics (Hungary); A. Schmatulla, Univ. of Ulm (Germany); A. Kőházi-Kis, K. Osvay, Univ. of Szeged (Hungary); O. Marti, Univ. of Ulm (Germany); Zs. Bor, Univ. of Szeged (Hungary)

*Author Index*

# Conference Committee

## *Symposium Chairs*

**Tuan Vo-Dinh**, Duke University (USA)  
**Robert A. Lieberman**, Intelligent Optical Systems, Inc. (USA)

## *Conference Chairs*

**Tuan Vo-Dinh**, Duke University (USA)  
**Robert A. Lieberman**, Intelligent Optical Systems, Inc. (USA)  
**Günter Gauglitz**, Universität Tübingen (Germany)

## *Program Committee*

**Francesco Baldini**, Istituto di Fisica Applicata Nello Carrara (Italy)  
**Stephanus Buettgenbach**, Technische Universität Braunschweig (Germany)  
**Luigi Campanella**, Università degli Studi di Roma, La Sapienza (Italy)  
**Masoud Ghandehari**, Polytechnic University (USA)  
**Fabien J. Josse**, Marquette University (USA)  
**Lothar U. Kempen**, Intelligent Optical Systems, Inc. (USA)  
**Robert Lascola**, Savannah River National Laboratory (USA)  
**Marco Leona**, The Metropolitan Museum of Art (USA)  
**Anna G. Mignani**, Istituto di Fisica Applicata Nello Carrara (Italy)  
**Klaus Schäfer**, Forschungszentrum Karlsruhe GmbH (Germany)  
**Khalid J. Siddiqui**, SUNY Fredonia (USA)  
**Jagdish Prasad Singh**, Mississippi State University (USA)  
**David L. Stokes**, EOIR Technologies, Inc. (USA)  
**Eiichi Tamiya**, Japan Advanced Institute of Science and Technology (Japan)  
**Irena Twardowska**, Polska Akademia Nauk (Poland)

## *Session Chairs*

- 1 Chemical Sensing  
**Robert A. Lieberman**, Intelligent Optical Systems, Inc. (USA)
- 2 Physical Sensing  
**Anna G. Mignani**, Istituto di Fisica Applicata Nello Carrara (Italy)
- 3 Biological Sensing  
**Tuan Vo-Dinh**, Duke University (USA)

- 4 Environmental Sensing I  
**Günter Gauglitz**, Universität Tübingen (Germany)  
**Claude Boccara**, Centre National de la Recherche Scientifique  
(France)
- 5 Environmental Sensing II  
**Günter Gauglitz**, Universität Tübingen (Germany)  
**Anna G. Mignani**, Istituto di Fisica Applicata Nello Carrara (Italy)
- 6 Sensor Components and Techniques  
**Lothar U. Kempen**, Intelligent Optical Systems, Inc. (USA)