

# PROCEEDINGS OF SPIE

## ***Organic Photonics VI***

**Barry P. Rand**  
**Chihaya Adachi**  
**David Cheyns**  
**Volker van Elsbergen**  
*Editors*

**15–16 April 2014**  
**Brussels, Belgium**

*Sponsored*  
SPIE

*Cosponsored by*  
B-PHOT—Brussels Photonics Team (Belgium)  
FWO—Fonds Wetenschappelijk Onderzoek (Belgium)  
Brussels-Capital Region (Belgium)  
Ville de Bruxelles (Belgium)  
MBRAUN  
Kurt J. Lesker Company

*Cooperating Organisations*  
CBO-BCO (Belgium)  
European Laser Institute  
Photonics 21 (Germany)  
EOS—European Optical Society (Germany)

*Published by*  
SPIE

**Volume 9137**

Proceedings of SPIE 0277-786X, V. 9137

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

Organic Photonics VI, edited by Barry P. Rand, Chihaya Adachi, David Cheyns, Volker van Elsbergen,  
Proc. of SPIE Vol. 9137, 913701 · © 2014 SPIE · CCC code: 0277-786X/14/\$18 · doi: 10.1117/12.2069526

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 *Organic Photonics VI*, edited by Barry P. Rand, Chihaya Adachi, David Cheyns, Volker van Elsbergen, Proceedings of SPIE Vol. 9137 (SPIE, Bellingham, WA, 2014)  
Article CID Number.

ISSN: 0277-786X  
ISBN: 9781628410853

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](http://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](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/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](http://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

vii Conference Committee

## LIGHT CONFINEMENT

---

- 9137 0D **Threshold reduction by multidimensional photonic confinement in metal-organic microcavities [9137-13]**  
A. Mischok, R. Brückner, C. Reinhardt, M. Sudzis, V. G. Lyssenko, H. Fröb, K. Leo, Technische Univ. Dresden (Germany)
- 9137 0E **Three-dimensional organic Fabry-Pérot microlasers [9137-14]**  
N. Sobeshchuk, Lab. de Photonique Quantique et Moléculaire, CNRS, Institut d'Alembert (France), Ecole Normale Supérieure de Cachan (France), and ITMO Univ. (Russian Federation); S. Bittner, C. Lafargue, J. Lautru, S. Charpignon, D. Ulbricht, Lab. de Photonique Quantique et Moléculaire, CNRS, Institut d'Alembert (France) and Ecole Normale Supérieure de Cachan (France); I. Y. Denisyuk, ITMO Univ. (Russian Federation); J. Zyss, M. Lebental, Lab. de Photonique Quantique et Moléculaire, CNRS, Institut d'Alembert (France) and Ecole Normale Supérieure de Cachan (France)

## ORGANIC LIGHT EMITTING DIODES I

---

- 9137 0J **Improvement of power efficiency and reduction of blur effect in OLED with micro-lens array films by reducing substrate thickness [9137-19]**  
C.-C. Ma, Y.-J. Chen, L.-J. Hsiao, H. Y. Lin, National Taiwan Univ. (Taiwan)
- 9137 0K **Improved designs for p-i-n OLEDs towards the minimal power loss of devices [9137-20]**  
D. Qin, Hebei Univ. of Technology (China) and Lucky Huaguang Graphics Co., Ltd. (China)

## ORGANIC LIGHT EMITTING DIODES II

---

- 9137 0O **Simulation of advanced OLED light extraction structures with novel FEM methods [9137-24]**  
L. Zschiedrich, JCMwave GmbH (Germany); T. Blome, Zuse-Institut Berlin (Germany); H. J. Greiner, Philips Technologie GmbH (Germany)

---

## ORGANIC SENSORS

---

- 9137 0Q **X-ray imaging sensor arrays on foil using solution processed organic photodiodes and organic transistors (Invited Paper) [9137-26]**  
A. Kumar, D. Moet, J.-L. van der Steen, A. Tripathi, F. G. Rodriguez, J. Maas, Holst Ctr. (Netherlands); M. Simon, W. Reutten, A. Douglas, Philips Research (Netherlands); R. Raijmakers, Philips Healthcare (Netherlands); P. E. Malinowski, K. Myny, IMEC (Belgium); U. Shafique, Univ. of Waterloo (Canada); R. Andriessen, Holst Ctr. (Netherlands); P. Heremans, Holst Ctr. (Netherlands) and IMEC (Belgium); G. Gelinck, Holst Ctr. (Netherlands)
- 9137 0T **IR spectroscopic studies of charge transfer in organic semiconductors [9137-29]**  
S. Beck, D. Gerbert, Univ. Heidelberg (Germany) and InnovationLab GmbH (Germany); C. Krekeler, InnovationLab GmbH (Germany) and Technische Univ. Braunschweig (Germany); T. Glaser, A. Pucci, Univ. Heidelberg (Germany) and InnovationLab GmbH (Germany)
- 9137 0U **Optical and topographic changes in water-responsive patterned cholesteric liquid crystalline polymer coatings [9137-30]**  
J. E. Stumpel, D. J. Broer, Technische Univ. Eindhoven (Netherlands); C. W. M. Bastiaansen, Technische Univ. Eindhoven (Netherlands) and Queen Mary Univ. of London (United Kingdom); A. P. H. J. Schenning, Technische Univ. Eindhoven (Netherlands)

---

## POSTER SESSION

---

- 9137 0Y **Organic semiconductor distributed feedback laser as excitation source in Raman spectroscopy using free-beam and fibre coupling (Best Student Paper Award) [9137-34]**  
X. Liu, S. Lebedkin, Karlsruher Institut für Technologie (Germany); T. Mappes, Karlsruher Institut für Technologie (Germany) and Carl Zeiss AG (Germany); S. Köber, C. Koos, M. Kappes, U. Lemmer, Karlsruher Institut für Technologie (Germany)
- 9137 0Z **Enhancement of power conversion efficiency in solution processed organic photovoltaic devices by embedded plasmonic gold-silica core-shell nanorods [9137-35]**  
X. Xu, T. K. S. Wong, X. Sun, Nanyang Technological Univ. (Singapore)
- 9137 12 **Light-controlled vector polyphotorchromism [9137-38]**  
I. Chaganava, G. Kakauridze, B. Kilosanidze, Y. Mshvenieradze, Georgian Technical Univ. (Georgia)
- 9137 14 **P3HT:PCBM:pentacene inverted polymer solar cells with roughened Al-doped ZnO nanorod array and photoelectrochemical treatment [9137-40]**  
H.-Y. Lee, H.-L. Huang, National Cheng Kung Univ. (Taiwan)
- 9137 15 **Bistable memory device based on DNA biopolymer nanocomposite [9137-41]**  
Y.-T. Lin, T.-Y. Lin, Y.-C. Hung, National Tsing Hua Univ. (Taiwan)
- 9137 18 **In-depth analysis of solvent effects on bulk heterojunction solar cell performance [9137-44]**  
R. Zohourian Abutorabi, M. Joodaki, K. Shahbazi, Ferdowsi Univ. of Mashhad (Iran, Islamic Republic of)

- 9137 19 **Synthesis of high-surface-area titanium dioxide by sol-gel process for DSSC** [9137-45]  
S. Wahyuningsih, A. H. Ramelan, G. Juliana, A. R. Khoirunisa, S. B. Rahardjo, E. Pramono,  
S. Suharyana, R. Suryana, A. Supriyanto, Univ. Sebelas Maret (Indonesia)
- 9137 1D **AZO electrodes deposited by atomic layer deposition for OLED fabrication** [9137-49]  
B. Dugrenil, I. Séguy, Lab. d'Analyse et d'Architecture des Systèmes, CNRS, Univ. de Toulouse (France); H. Y. Lee, National Cheng Kung Univ. (Taiwan); T. Camps, Lab. d'Analyse et d'Architecture des Systèmes, CNRS, Univ. de Toulouse (France); Y.-C. Lin, National Cheng Kung Univ. (Taiwan); J. B. Doucet, Lab. d'Analyse et d'Architecture des Systèmes, CNRS, Univ. de Toulouse (France); Y.-S. Chiu, National Cheng Kung Univ. (Taiwan); L. Salvagnac, E. Bedel-Pereira, Lab. d'Analyse et d'Architecture des Systèmes, CNRS, Univ. de Toulouse (France); M. Ternisien, Univ. Paul Sabatier (France); C. Lee, National Cheng Kung Univ. (Taiwan); V. Cardinal, Lab. d'Analyse et d'Architecture des Systèmes, CNRS, Univ. de Toulouse (France)
- 9137 1E **Amplified spontaneous emission of glass forming DCM derivatives in PMMA films** [9137-50]  
A. Vembris, Univ. of Latvia (Latvia); E. Zarinsh, V. Kokars, Riga Technical Univ. (Latvia)
- 9137 1G **Photoelectrical properties of indandione fragment containing azobenzene compounds** [9137-52]  
J. Latvels, R. Grzibovskis, K. Pudzs, A. Vembris, Univ. of Latvia (Latvia); D. Blumberga, Riga Technical Univ. (Latvia)
- 9137 1H **Electrical and electro-optic characterization of nonlinear polymer thin films on silicon substrate** [9137-53]  
S. Prorok, M. Schulz, A. Petrov, M. Eich, Technische Univ. Hamburg-Harburg (Germany); J. Luo, A. K.-Y. Jen, Univ. of Washington (United States)
- 9137 1J **Investigation of self-assembled monolayer formation using infrared-reflection-absorption-spectroscopy** [9137-55]  
S. Hillebrandt, T. Glaser, A. Pucci, Univ. Heidelberg (Germany) and InnovationLab GmbH (Germany)

*Author Index*



# Conference Committee

## Symposium Chairs

**Francis Berghmans**, Vrije Universiteit Brussel (Belgium)  
**Ronan Burgess**, European Commission (Belgium)  
**Jürgen Popp**, Institut für Photonische Technologien e.V. (Germany)  
**Peter Hartmann**, SCHOTT AG (Germany)

## Honorary Symposium Chair

**Hugo Thienpont**, Vrije Universiteit Brussel (Belgium)

## Conference Chairs

**Barry P. Rand**, Princeton University (United States)  
**Chihaya Adachi**, Kyushu University (Japan)  
**David Cheyns**, IMEC (Belgium)  
**Volker van Elsbergen**, Philips Technologie GmbH (Germany)

## Conference Programme Committee

**Heinrich Becker**, Merck OLED Materials GmbH (Germany)  
**David Beljonne**, Université de Mons (Belgium)  
**Paul W. M. Blom**, University of Groningen (Netherlands)  
**Donal D. C. Bradley**, Imperial College London (United Kingdom)  
**Franco Cacialli**, University College London (United Kingdom)  
**Enrico Da Como**, Ludwig-Maximilians-Universität München (Germany)  
**Richard H. Friend**, University of Cambridge (United Kingdom)  
**Alan J. Heeger**, University of California, Santa Barbara (United States)  
**Paul L. Heremans**, IMEC (Belgium)  
**René A. J. Janssen**, Technische University Eindhoven (Netherlands)  
**Junji Kido**, Yamagata University (Japan)  
**Jang-Joo Kim**, Seoul National University (Korea, Republic of)  
**Guglielmo Lanzani**, Politecnico di Milano (Italy)  
**Karl Leo**, Fraunhofer-Einrichtung für Organik, Materialien und  
Elektronische Bauelemente COMEDD (Germany)  
**Niyazi Serdar Sariciftci**, Johannes Kepler Universität Linz (Austria)  
**Paul van der Schaaf**, BASF Schweiz AG (Switzerland)  
**Chung-Chih Wu**, National Taiwan University (Taiwan)

## Session Chairs

- 1    Organic Photovoltaics I  
**Barry P. Rand**, Princeton University (United States)

- 2    Organic Photovoltaics II  
**David Cheyns**, IMEC (Belgium)
- 3    Light Confinement  
**Chihaya Adachi**, Kyushu University (Japan)
- 4    Organic Light Emitting Diodes I  
**Chihaya Adachi**, Kyushu University (Japan)
- 5    Organic Light Emitting Diodes II  
**Volker van Elsbergen**, Philips Technologie GmbH (Germany)
- 6    Organic Sensors  
**David Cheyns**, IMEC (Belgium)