# **PROCEEDINGS OF SPIE**

# **Organic Field-Effect Transistors X**

Zhenan Bao Iain McCulloch Editors

22–23 August 2011 San Diego, California, United States

Sponsored by SPIE

Cosponsored by: Merck Chemicals Ltd. (United Kingdom) Solvay S.A. (Belgium) Cambridge Display Technology Ltd. (United Kingdom) Heraeus Clevios GmbH (Germany) Aldrich Materials Science

Published by SPIE

Volume 8117

Proceedings of SPIE, 0277-786X, v. 8117

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 Organic Field-Effect Transistors X, edited by Zhenan Bao, Iain McCulloch, Proceedings of SPIE Vol. 8117 (SPIE, Bellingham, WA, 2011) Article CID Number.

ISSN 0277-786X ISBN 9780819487278

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 © 2011, 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/11/\$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.



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

v Conference Committee

#### MATERIALS I

- 8117 02 Synthesis and characterizations of linear- and angular-shaped naphthodithiophenes for organic semiconductors (Invited Paper) [8117-01]
  K. Takimiya, I. Osaka, S. Shinamura, E. Miyazaki, Hiroshima Univ. (Japan)
- 8117 04 Charge transport properties of carbazole dendrimers in organic field-effect transistors [8117-03]
   K. Mutkins, S. S. Y. Chen, M. Aljada, B. J. Powell, S. Olsen, P. L. Burn, P. Meredith, The Univ. of Queensland (Australia)

#### MATERIALS II

- 8117 09 Conductors and semiconductors for advanced organic electronics (Invited Paper) [8117-08]
   T. Meyer-Friedrichsen, W. Lövenich, Heraeus Clevios GmbH (Germany); R. Lubianez, Heraeus
- 8117 0A Phthalocyanine derivatives for solution-processed organic thin-film transistors (Invited Paper) [8117-09]
  Y. Geng, S. Dong, H. Tian, D. Yan, F. Wang, Changchun Institute of Applied Chemistry (China)

#### MORPHOLOGY II

Materials Technology LLC (United States)

 8117 0J Organic single-crystal transistors: development of solution processes and charge transport mechanisms (Invited Paper) [8117-18]
 T. Uemura, J. Takeya, Osaka Univ. (Japan)

#### DEVICES I

 8117 0Q Fast behavioral modeling of organic CMOS devices for digital and analog circuit applications [8117-25]
 S. Jacob, A. Daami, R. Gwoziecki, R. Coppard, Commissariat à l'Énergie Atomique (France); R. Hamani, M. Guerin, E. Bergeret, P. Pannier, Institut Matériaux Microélectronique et Nanosciences de Provence, CNRS (France)

#### DEVICES II

- 8117 0Y Printed thin film transistor: materials and applications (Invited Paper) [8117-33] A. C. Arias, T. N. Ng, G. Whiting, J. Daniel, Palo Alto Research Ctr., Inc. (United States)
- 8117 0Z Patterned electrode vertical OFET: analytical description, switching mechanisms, and optimization rules (Best Student Paper Award) [8117-34]
  A. J. Ben-Sasson, N. Tessler, Technion-Israel Institute of Technology (Israel)
- 8117 10 A high performance solution processable organic semiconductor material for OTFT devices (Invited Paper) [8117-36]
   C. J. Newsome, J. C. Carter, R. J. Wilson, J. H. Burroughes, Cambridge Display Technology Ltd. (United Kingdom)

#### **DEVICES III**

- 8117 12 Morphology of cleaved rubrene and its evolution in an ambient environment [8117-38]
  R. J. Thompson, London Ctr. for Nanotechnology (United Kingdom) and Univ. College London (United Kingdom); B. Yadin, Z. J. Grout, London Ctr. for Nanotechnology (United Kingdom); S. Hudziak, Univ. College London (United Kingdom); C. L. Kloc, Nanyang Technological Univ. (Singapore); N. J. Curson, O. Mitrofanov, London Ctr. for Nanotechnology (United Kingdom) and Univ. College London (United Kingdom)
- 8117 13 Impedance spectroscopy for pentacene field-effect transistor: channel formation process in transistor operation [8117-39]
  Y. Tanaka, Y. Noguchi, Chiba Univ. (Japan); M. Kraus, W. Brütting, Univ. Augsburg (Germany); H. Ishii, Chiba Univ. (Japan)

Author Index

# **Conference Committee**

### Symposium Chair

Zakya H. Kafafi, National Science Foundation (United States)

### **Conference** Chairs

Zhenan Bao, Stanford University (United States) Iain McCulloch, Imperial College London (United Kingdom)

## Session Chairs

- 1 Materials I Iain McCulloch, Imperial College London (United Kingdom)
- 2 Materials II **Zhenan Bao**, Stanford University (United States)
- 3 Morphology I Aram Amassian, King Abdullah University of Science and Technology (Saudi Arabia)
- Morphology II
  Kilwon Cho, Pohang University of Science and Technology (Korea, Republic of)
- 5 Devices I Christopher J. Newsome, Cambridge Display Technology Ltd. (United Kingdom)
- 6 Thin Films Ana Claudia Arias, University of California, Berkeley (United States)
- 7 Devices II
  Natalie Stingelin-Stutzmann, Imperial College London (United Kingdom)
- 8 Devices III Alberto Salleo, Stanford University (United States)