# PROCEEDINGS OF SPIE

# Optoelectronic Devices: Physics, Fabrication, and Application IV

Joachim Piprek Jian J. Wang Editors

11 September 2007 Boston, Massachusetts, USA

Sponsored and Published by SPIE

Volume 6766

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 Optoelectronic Devices: Physics, Fabrication, and Application IV, edited by Joachim Piprek, Jian J. Wang, Proceedings of SPIE Vol. 6766 (SPIE, Bellingham, WA, 2007) Article CID Number.

ISSN 0277-786X ISBN 9780819469267

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. 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.



**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	NANOSTRUCTURES				
6766 03	Enhanced luminescence of top-emission organic light emitting diodes with ZnS/Ag/7 structure (Invited Paper) [6766-02] WF. Liao, J. Huang, CJ. Ni, YB. Guo, CH. Teng, F. CN. Hong, National Cheng Ku Univ. (Taiwan)				
6766 05	Coherent optical manipulation of a single spin state in a charged quantum dot: theory an modelling (Invited Paper) [6766-04] G. M. Slavcheva, Univ. of Surrey (United Kingdom)				
SESSION 2	OPTICAL SENSORS				
6766 06	A 130-nm CMOS single-photon avalanche diode (Invited Paper) [6766-05] C. Niclass, M. Gersbach, Ecole Polytechnique Fédérale de Lausanne (Switzerland); R. Henderson, Univ. of Edinburgh (United Kingdom); L. Grant, ST Microelectronics (United Kingdom); E. Charbon, Ecole Polytechnique Fédérale de Lausanne (Switzerland)				
6766 07	Highly sensitive refractive index sensors [6766-06] J. J. Wang, NanoNuvo Corp. (USA)				
SESSION 3	NOVEL MATERIALS				
6766 OA	Interfacial physics in organic light emitting devices (Invited Paper) [6766-09] Cl. Wu, National Taiwan Univ. (Taiwan)				
6766 OC	Origin of the high photoconductive gain in AlGaN films (Invited Paper) [6766-11] T. D. Moustakas, M. Misra, Boston Univ. (USA)				
SESSION 4	NOVEL DEVICES				
6766 OF	Long-wavelength VCSELs for optical networks and trace-gas monitoring (Invited Paper) [6766-14] W. Hofmann, G. Böhm, Technische Univ. München (Germany); M. Ortsiefer, Vertilas GmbH (Germany); M. Görblich, C. Lauer, Technische Univ. München (Germany); N. H. Zhu, Institute of Semiconductors (China); MC. Amann, Technische Univ. München (Germany)				
6766 OG	Recent progress on GaN-based vertical cavity surface emitting lasers (Invited Paper) [6766-15] T. C. Lu, C. C. Kao, G. S. Huang, H. C. Kuo, S. C. Wang, National Chiao Tung Univ. (Taiwan)				

# 6766 0H Analysis of wavelength-dependent performance variations of GaN-based ultraviolet lasers [6766-16]

J. Piprek, NUSOD Institute (USA); H. Wenzel, Ferdinand-Braun-Institut für Höchstfrequenztechnik (Germany); M. Kneissl, Technical Univ. of Berlin (Germany) and Ferdinand-Braun-Institut für Höchstfrequenztechnik (Germany)

#### **POSTER SESSION**

- 6766 01 **Optical triode with quantum dot semiconductor optical amplifiers** [6766-17] J.-H. Huh, Y. Kuroki, S. Maki, Y. Maeda, Toyota Technological Institute (Japan)
- 6766 OJ **Guided-mode resonance sensor with extended spatial sensitivity** [6766-18] D. Fattal, M. Sigalas, Hewlett-Packard Labs. (USA); A. Pyayt, Hewlett-Packard Labs. (USA) and Univ. of Washington (USA); Z. Li, R. G. Beausoleil, Hewlett-Packard Labs. (USA)
- 6766 OK

  Identification device [6766-19]

  J.-S. Lin, C.-C. Su, T.-H. Chou, Industrial Technology Research Institute (Taiwan); M.-L. Wu,
  National Central Univ. (Taiwan); C.-L. Lai, Industrial Technology Research Institute (Taiwan);
  C.-L. Hsu, H.-C. Lan, H.-I. Huang, Y.-C. Liu, Z.-R. Tu, C.-C. Lee, J.-Y. Chang, National Central
  Univ. (Taiwan)
- 6766 0N Quantum dot resonant tunneling diodes for telecom wavelength single-photon detection [6766-23]

H. W. Li, Toshiba Research Europe Ltd. (United Kingdom); P. Simmonds, H. E. Beere, Univ. of Cambridge (United Kingdom); B. E. Kardynał, Toshiba Research Europe Ltd. (United Kingdom); D. A. Ritchie, Univ. of Cambridge (United Kingdom); A. J. Shields, Toshiba Research Europe Ltd. (United Kingdom)

6766 0Q Waveguide fabrication in PMMA using a modified cavity femtosecond oscillator [6766-26] K. Wang, D. Klimov, Z. Kolber, Monterey Bay Aquarium Research Institute (USA)

**Author Index** 

# **Conference Committee**

## Symposium Chairs

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

## Conference Chairs

Joachim Piprek, NUSOD Institute (USA)
Jian J. Wang, NanoNuvo Corporation (USA)

## Program Committee

Silvano Donati, Università degli Studi di Pavia (Italy)

Lingjie J. Guo, University of Michigan (USA)

Archie L. Holmes, Jr., University of Virginia (USA)

Zhengyu Huang, RSoft Design Group, Inc. (USA)

Bernd Kriegel, Silicon Sensor International AG (Germany)

Norbert Linder, OSRAM Opto Semiconductors GmbH (Germany)

**Ekmel Özbay**, Bilkent University (Turkey)

Richard P. Ratowsky, Lawrence Livermore National Laboratory (USA)

**Spilios Riyopoulos**, Science Applications International Corporation (USA)

Chi-Kuang Sun, National Taiwan University (Taiwan)

**Günther Tränkle**, Ferdinand-Braun-Institut für Höchstfrequenztechnik (Germany)

Wei Wu, Hewlett-Packard Laboratories (USA)

Ping P. Xie, NeoPhotonics (USA)

### Session Chairs

1 Nanostructures

Jian J. Wang, NanoNuvo Corporation (USA)

2 Optical Sensors

David A. Fattal, Hewlett-Packard Laboratories (USA)

3 Novel Materials

Joachim Piprek, NUSOD Institute (USA)

4 Novel Devices

Joachim Piprek, NUSOD Institute (USA)