

**Compound Semiconductors for Energy
Applications and Environmental
Sustainability—2011**

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EDITORS

L. Douglas Bell

Jet Propulsion Laboratory
Pasadena, California, U.S.A.

F. (Shadi) Shahedipour-Sandvik

University at Albany–SUNY
Albany, New York, U.S.A.

Kenneth A. Jones

U.S. Army Research Laboratory
Adelphi, Maryland, U.S.A.

Daniel Schaadt

Karlsruhe Institute of Technology
Karlsruhe, Germany

Blake S. Simpkins

Naval Research Laboratory
Washington, District of Columbia, U.S.A.

Miguel A. Contreras

National Renewable Energy Laboratory
Golden, Colorado, U.S.A.



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CONTENTS

Preface ix

Materials Research Society Symposium Proceedings xi

NITRIDES

Indium Gallium Nitride on Germanium by Molecular Beam Epitaxy 3

R.R. Lieten, W.-J. Tseng, M. Leys, J.-P. Locquet,
and J. Dekoster

Crack-free III-nitride Structures (> 3.5 μm) on Silicon 9

Mihir Tungare, Jeffrey M. Leathersich,
Neeraj Tripathi, Puneet Suvarna,
Fatemeh (Shadi) Shahedipour-Sandvik,
Timothy A. Walsh, Randy P. Tompkins,
and Kenneth A. Jones

Comparison of Aluminum Nitride Nanowire Growth with and without Catalysts via Chemical Vapor Deposition 17

Kasif Teker and Joseph A. Oxenham

Enhanced Light Emission at Self-assembled GaN Inversion Domain Boundary 23

Mei-Chun Liu, Yuh-Jen Cheng, Jet-Rung Chang,
and Chun-Yen Chang

* **AlGaIn Channel HEMT with Extremely High Breakdown Voltage** 29

Takuma Nanjo, Misaichi Takeuchi, Akifumi Imai,
Yousuke Suzuki, Muneyoshi Suita, Katsuomi Shiozawa,
Yuji Abe, Eiji Yagyu, Kiichi Yoshiara,
and Yoshinobu Aoyagi

Fabrication and Optical Properties of Green Emission Semipolar {10 $\bar{1}$ 1} InGaIn/GaN MQWs Selective Grown on GaN Nanopyramid Arrays 37

Shih-Pang Chang, Jet-Rung Chang, Ji-Kai Huang,
Jinchai Li, Yi-Chen Chen, Kuok-Pan Sou,
Yun-Jing Li, Hung-Chih Yang, Ta-Cheng Hsu,
Tien-Chang Lu, Hao-Chung Kuo, and Chun-Yen Chang

*Invited Paper

CdTe/CdS

Morphology Control of Copper Indium Disulfide Nanocrystals .....	.45
Marta Kruszynska, Holger Borchert, Jürgen Parisi, and Joanna Kolny-Olesiak	
A Comparative Study of the Thin-Film CdTe Solar Cells with ZnSe/TCO and the CdS/TCO Buffer Layers .....	.51
Tamara Potlog, Nicolae Spalatu, Arvo Mere, Jaan Hiie, and Valdek Mikli	
Influence of Surface Preparation on Scanning Kelvin Probe Microscopy and Electron Backscatter Diffraction Analysis of Cross Sections of CdTe/CdS Solar Cells .....	.57
H.R. Moutinho, R.G. Dhere, C.-S. Jiang, and M.M. Al-Jassim	
CdS_xTe_{1-x} Alloying in CdS/CdTe Solar Cells .....	.63
Joel N. Duenow, Ramesh G. Dhere, Helio R. Moutinho, Bobby To, Joel W. Pankow, Darius Kuciauskas, and Timothy A. Gessert	
Influence of Annealing in H₂ Atmosphere on the Electrical Properties of Thin Film CdS .....	.69
Natalia Maticiuc, Jaan Hiie, Tamara Potlog, Vello Valdna, and Aleksei Gavrilov	

CIGS/CIS

Properties of CuIn_{1-x}Ga_xSe₂ Films Prepared by the Rapid Thermal Annealing of Spray-deposited CuIn_{1-x}Ga_xS₂ and Se .....	.77
Laura E. Slaymaker, Nathan M. Hoffman, Matthew A. Ingersoll, Matthew R. Jensen, Jiří Olejníček, Christopher L. Exstrom, Scott A. Darveau, Rodney J. Soukup, Natale J. Ianno, Amitabha Sarkar, and Štěpán Kment	

I-III-VI₂ (Copper Chalcopyrite-based) Thin Films for Photoelectrochemical Water-splitting Tandem-hybrid Photocathode.83
 Jess M. Kaneshiro, Alexander Deangelis, Xi Song, Nicolas Gaillard, and Eric L. Miller

Identification of Impurity Phases in Cu₂ZnSnS₄ Thin-film Solar Cell Absorber Material by Soft X-ray Absorption Spectroscopy91
 M. Bär, B.-A. Schubert, R.G. Wilks, B. Marsen, Y. Zhang, M. Blum, S. Krause, W. Yang, T. Unold, L. Weinhardt, C. Heske, and H.-W. Schock

*** Kesterites and Chalcopyrites: A Comparison of Close Cousins97**
 Ingrid Repins, Nirav Vora, Carolyn Beall, Su-Huai Wei, Yanfa Yan, Manuel Romero, Glenn Teeter, Hui Du, Bobby To, Matt Young, and Rommel Noufi

Impact of Thickness Variation of the ZnO:Al Window Layer on Optoelectronic Properties of CIGS₂ Solar Cells109
 Jan Keller, Martin Knipper, Jürgen Parisi, Ingo Riedel, Thomas Dalibor, and Alejandro Avellan

Fabrication of High Efficiency Flexible CIGS Solar Cell with ZnO Diffusion Barrier on Stainless Steel Substrate115
 Bae Dowon, Kwon Sehan, Oh Joonjae, Lee Joowon, and Kim Wookyoung

Copper Indium Diselenide Thin Films Using a Hybrid Method of Chemical Bath Deposition and Thermal Evaporation121
 R. Ernesto Ornelas A, Sadasivan Shaji, Omar Arato, David Avellaneda, Alan Castillo, Tushar Kanti Das Roy, and Bindu Krishnan

III-V AND OTHER MATERIALS

The Two Origins of p-type Conduction in Transparent Conducting Ga-doped SnO₂ Thin Films.131
 Huan-hua Wang, Tieying Yang, Baoyi Wang, Kurash Ibrahim, and Xiaoming Jiang

*Invited Paper

DEMUX SiC Optical Transducers for Fluorescent Proteins Detection .....	.137
M. Vieira, P. Louro, M.A. Vieira, M. Fernandes, and J. Costa	
Transmission Electron Microscopy of Misfit Dislocation and Strain Relaxation in Lattice Mismatched III-V Heterostructures Versus Substrate Surface Treatment .....	.143
Y. Wang, P. Ruterana, L. Desplanque, S. El Kazzi, and X. Wallart	
Structure and Photocatalytic Properties of Bi₂₅FeO₄₀ Crystallites Derived from the PEG Assisted Sol-gel Methods .....	.149
Shundong Bu, Dengrong Cai, Jianmin Li, Shengwen Yu, Dengren Jin, and Jinrong Cheng	
Zinc Nitride Films by Reactive Sputtering of Zn in N₂-containing Atmosphere .....	.157
Nanke Jiang, Daniel G. Georgiev, Ahalapitiya H. Jayatissa, and Ting Wen	
Author Index .....	.163
Subject Index .....	.165

PREFACE

This volume contains a subset of Oral and Poster presentations that were made during Symposium D, “Compound Semiconductors for Energy Applications and Environmental Sustainability”, at the 2011 MRS Spring Meeting held April 25-29 in San Francisco, California.

Compound semiconductors have long been an integral part of everyday life. Many of these semiconductors exhibit direct band gaps that are tailorable over a wide range of energy. This property can be leveraged for many energy-related applications such as efficient lighting, high-efficiency solar cells, and efficient switching. Recent progress on their potential as emitters, sensing devices in biological and chemical environments, and high efficiency power devices demonstrates their impact on conservation of energy and environment, and on mitigation of climate change. Compound semiconductor-based photovoltaic systems are emerging as an economical means of generating renewable energy through the use of concentrator technologies. The significant funding by various federal (e.g., Department of Energy’s Sunshot Initiative) and state agencies as well as industry clearly signifies the importance of green energy and its role in supplementing and potentially replacing greenhouse-generating fuels.

Use of compound semiconductors such as the III-nitride family of materials has played the most significant role in the realization of solid state lighting as a viable means for potentially full replacement of the traditional means of lighting such as fluorescent and incandescent lighting. In order to fully realize this potential, fundamental scientific questions such as efficiency droop in green LEDs need to be addressed. Research into the use of III-nitrides for photovoltaic (PV) applications is also significant, attracting much attention as full-solar spectrum PV materials. InSb and CuInGaSe are also being researched as the major players in the PV field. Nanostructures based on these compound semiconductors show favorable properties such as more efficient collection and transport of carriers. Multijunction solar cells using InGaAs and InGaP are important players in space applications, where efficiency is the critical metric, but continued progress may make these contenders in the commercial marketplace.

These are only a few of the many examples of the significant role compound semiconductors will play in our energy future. Understanding the interaction of these compounds with their environment, including any potentially negative impact they may have on organisms and the natural environment, are other topics that need much research. This volume contains reports from internationally known experts on the state of compound semiconductor-based devices with applications to environmental conservation and energy use reduction, challenges associated with realization of such devices, and obstacles to their widespread use.

The Organizers wish to thank all who contributed to the success of Symposium D, in particular the authors, reviewers, and the MRS staff.

L. Douglas Bell
F. (Shadi) Shahedipour-Sandvik
Kenneth. A. Jones
Daniel Schaadt
Blake S. Simpkins
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