PROCEEDINGS OF SPIE

Nanoscale Photonic and Cell Technologies for Photovoltaics II

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Editor

2–4 August 2009
San Diego, California, United States

Sponsored and Published by
SPIE

Volume 7411

Proceedings of SPIE, 0277-786X, v. 7411

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Please use the following format to cite material from this book:
Author(s), "Title of Paper," in *Nanoscale Photonic and Cell Technologies for Photovoltaics II*, edited by Loucas Tsakalakos, Proceedings of SPIE Vol. 7411 (SPIE, Bellingham, WA, 2009) Article CID Number.

ISSN 0277-786X
ISBN 9780819477019

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

Printed in the United States of America.

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

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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:

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Contents

NANOPHOTONICS FOR PHOTOVOLTAICS I

NANOPHOTONICS FOR PHOTOVOLTAICS II

NANOPHOTONICS FOR PHOTOVOLTAICS III

POSTER SESSION

Conference Committee

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Wilfried G. J. H. M. van Sark, Universiteit Utrecht (Netherlands)
Xianfan Xu, Purdue University (United States)

Session Chairs

1 Inorganic Nano Solar Cells I
Loucas Tsakalakos, GE Global Research (United States)

2 Inorganic Nano Solar Cells II
Loucas Tsakalakos, GE Global Research (United States)

3 Nanostructured Organic and Hybrid Solar Cells I: Joint Session with Conference 7416
Sean E. Shaheen, University of Denver (United States)

4 Nanostructured Organic and Hybrid Solar Cells II: Joint Session with Conference 7416
Dana C. Olson, National Renewable Energy Laboratory (United States)

5 Nanophotonics for Photovoltaics I
Wilfried G. J. H. M. van Sark, Universiteit Utrecht (Netherlands)

6 Nanophotonics for Photovoltaics II
Xianfan Xu, Purdue University (United States)

7 Nanophotonics for Photovoltaics III
Eray S. Aydil, University of Minnesota (United States)

Introduction

The solar energy industry has seen strong growth in the last decade. While the recent recession has certainly had a big impact on the photovoltaics (PV) industry through a lack of credit that has seen inventories soar and prices for Si modules drop to unprecedented levels, it is expected that in the long run the industry will again see good growth levels. Indeed, the emergence of CdTe thin film technology as a major rival to silicon underscores this point. Conventional silicon and thin film PV technologies are well developed and capable of meeting the clean energy demands of many markets. Nevertheless, there continues to be interest within the research community in developing technologies that can simultaneously reduce cost yet also provide breakthrough performance.

To this effect, research efforts in studying and applying the unique optical, electrical, and structural/architectural properties of nanostructures to solar energy applications, either as novel photonic structures or as new solar cell device structures, continue to flourish. This year's second installment of the conference devoted to this topic (7411: Nanoscale Photonic and Cell Technologies for Photovoltaics II), held at SPIE Optics & Photonics in 2009 as part of the Solar Energy + Technology Symposium, once again demonstrated the strong interest in this field of research.

The first two sessions of the conference were focused on Inorganic Nano Solar Cells. Recent developments in Si and II-VI wire, group IV quantum dots, and II-VI nanocrystal solar cells were presented. The third and fourth sessions were in fact joint session with the Organic Photovoltaics conference, and featured advances in Nanostructured Organic and Hybrid Solar Cells. These included application of fullurenes to bulk heterojunction solar cells, new electrodes, dye-sensitized solar cells, and the new results in plasmonics for excitonic PV devices. The final three sessions of the conference were devoted to the application of Nanophotonics for Photovoltaics, i.e. the use of novel layers and structures for light management in PV applications. After a broad overview of 3rd Generation Photovoltaics, numerous presentations on up-conversion, plasmonics, light trapping, nanowire-based transparent conductors, and photonic bandgap structures, among other topics, were given. A collection of excellent posters on various nanostructured PV topics further contributed to the conference.

The conference was also highlighted by the addition of a panel discussion on Commercialization of Next Generation Solar Technologies, in which experts from academia and industry discussed the prospects and challenges in developing novel PV technologies based on organic and inorganic structures. The panelists were as follows:

Harry A. Atwater, Jr., California Institute of Technology (United States)
Gilles Dennler, Konarka Austria Forschungs und Entwicklungs GmbH (Austria)
Damoder Reddy, Solexant (United States)
Christiana B. Honsberg, Arizona State Univ. (United States)
Darin W. Laird, Plextronics Inc. (United States)
Moritz K. Riede, IAPP, Technische Univ. Dresden (Germany)
Wladek Walukiewicz, RoseStreet Labs (United States)
James H. Ermer, Spectrolab, Inc. (United States)

Some panelists argued Si will continue to be an important technology in the PV industry and hence new technologies enhancing Si would emerge, whereas others argued that novel polymer and nanoscale inorganic solar cells will fundamentally alter the PV landscape in years to come, though it was noted that the various technologies under development are not necessarily mutually exclusive. Researchers working on conventional PV technologies noted an interest in better understanding the unique characteristics of advanced PV concepts, and a strong interest in concentrator PV was also shown by a robust discussion on the topic. The large audience turnout and participation pointed to the continued strong interest in the development of advanced photovoltaic concepts.

Once again, the conference provided an excellent forum for the interchange of advanced/nanoscale photonic and device concepts in photovoltaics. I would like to thank the conference program committee (Drs. E. S. Aydil, A. Salleo, J. Schoonman, S. E. Shaheen, W. G. J. H. M. van Sark, and X. Xu) for their support, as well as the session chairs, authors, and SPIE staff for their help in making this a successful conference. The strong support of Dr. M. Symko-Davies, chair of the 2009 Solar Energy + Technology symposium, is also greatly appreciated.

Loucas Tsakalakos