

PROCEEDINGS OF SPIE

Wide Bandgap Materials, Devices, and Applications IV

**Mohammad Matin
Andrew P. Lange
Achyut K. Dutta**
Editors

**14–15 August 2019
San Diego, California, United States**

Sponsored and Published by
SPIE

Volume 11126

Proceedings of SPIE 0277-786X, V. 11126

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

Wide Bandgap Materials, Devices, and Applications IV, edited by Mohammad Matin, Andrew P. Lange, Achyut K. Dutta
Proc. of SPIE Vol. 11126, 1112601 · © 2019 SPIE · CCC code: 0277-786X/19/\$21 · doi: 10.1117/12.2551556

Proc. of SPIE Vol. 11126 1112601-1

The papers 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. Additional papers and presentation recordings may be available online in the SPIE Digital Library at SPIEDigitalLibrary.org.

The papers 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 these proceedings:

Author(s), "Title of Paper," in *Wide Bandgap Materials, Devices, and Applications IV*, edited by Mohammad Matin, Andrew P. Lange, Achyut K. Dutta, Proceedings of SPIE Vol. 11126 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

ISSN: 0277-786X
ISSN: 1996-756X (electronic)

ISBN: 9781510629455
ISBN: 9781510629462 (electronic)

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 © 2019, 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 \$21.00 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/19/\$21.00.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

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

**SPIE. DIGITAL
LIBRARY**
SPIEDigitalLibrary.org

Paper Numbering: *Proceedings of SPIE* follow an e-First publication model. A unique citation identifier (CID) number is assigned to each article at the time of 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 and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- The first five 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.

Contents

v	<i>Authors</i>
vii	<i>Conference Committee</i>
ix	<i>Introduction</i>

THEORY, GROWTH, FABRICATION, AND CHARACTERIZATION OF WBG MATERIALS AND DEVICES II

11126 06	Towards high V_{oc}, thin film, homojunction WS_2 solar cells for energy harvesting applications (Invited Paper) [11126-7]
11126 07	First-principles study of the single- and double-walled nanotubes of TiO_2 [11126-8]
11126 0A	Recurrent neural network (RNN-LSTM) based forecasting of PV based islanded microgrid [11126-15]

POSTER SESSION

11126 0F	Electronic structure and optical properties of Mg and Al doped ZnO using (TB-mBJ) modified Becke Johnson potential study [11126-16]
11126 0L	Power management for PV-battery based hybrid microgrid using WBG devices [11126-22]
11126 0M	Design and analysis of an isolated bidirectional DC/DC converter with wide band-gap devices for a fuel cell vehicle [11126-23]

Authors

Numbers in the index correspond to the last two digits of the seven-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first five digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

Alatawi, Khaled, 0L
Almadhor, Ahmad, 0A
An, Jiao, 07
Anand Pandarinath, M., 0F
Eltief, Salah, 0M
Gao, D., 0A
Kumar, Aravindh, 06
Mahesh, R., 0F
Matin, Mohammad, 0A, 0L, 0M
Moreira de Menezes, Maria Thereza, 06
Nassiri Nazif, Koosha, 06
Peng, Yuting, 07
Sai Charan, P., 0F
Saketh, N., 0F
Saraswat, Krishna, 06
Tan, Zhi, 07
Tifour, Benali, 0M
Wanaguru, Prabath, 07
Zhang, Qiming, 07

Conference Committee

Program Track Chair

Ruyan Guo, The University of Texas at San Antonio (United States)

Conference Chairs

Mohammad Matin, University of Denver (United States)

Andrew P. Lange, Lawrence Livermore National Laboratory
(United States)

Achyut K. Dutta, Banpil Photonics, Inc. (United States)

Conference Program Committee

Mowafak M. Al-Jassim, National Renewable Energy Laboratory
(United States)

Abdul A. S. Awwal, Lawrence Livermore National Laboratory
(United States)

Srabanti Chowdhury, Stanford University (United States)

Selim Elhadj, Lawrence Livermore National Laboratory (United States)

Daniel F. Feezell, The University of New Mexico (United States)

David Wenzhong Gao, University of Denver (United States)

Muhammad N. Huda, The University of Texas at Arlington (United States)

M. Saif Islam, University of California, Davis (United States)

Karl Knieriem, RaySent Technologies Inc. (United States)

Hidenori Mimura, Shizuoka University (Japan)

Rebecca J. Nikolic, Lawrence Livermore National Laboratory
(United States)

Madan Niraula, Nagoya Institute of Technology (Japan)

Nezih Pala, Florida International University (United States)

Vijay Parameshwaran, U.S. Army Research Laboratory (United States)

Siddha Pimputkar, Lehigh University (United States)

Xiaolong Qiang, Northeastern University (China)

Lars F. Voss, Lawrence Livermore National Laboratory (United States)

Session Chairs

- 1 Theory, Growth, Fabrication, and Characterization of WBG Materials and Devices I

Andrew P. Lange, Lawrence Livermore National Laboratory
(United States)

Achyut K. Dutta, Banpil Photonics, Inc. (United States)

- 2 Theory, Growth, Fabrication, and Characterization of WBG Materials and Devices II
Andrew P. Lange, Lawrence Livermore National Laboratory
(United States)
Achyut K. Dutta, Banpil Photonics, Inc. (United States)
- 3 Engineering Challenges and Applications of WBG Materials and Devices
Mohammad A. Matin, University of Denver (United States)
Andrew P. Lange, Lawrence Livermore National Laboratory
(United States)