

PROCEEDINGS OF SPIE

***International Workshop on Thin Films
for Electronics, Electro-Optics,
Energy, and Sensors 2019***

**Partha Banerjee
Karl Gudmundsson
Akhlesh Lakhtakia
Guru Subramanyam**
Editors

**June 24–26, 2019
Reykjavik, Iceland**

Organized by
Center of Excellence for Thin Films Research and Surface Engineering, University of Dayton
(United States)

In Collaboration With
Pennsylvania State University (United States)
The University of Iceland

Published by
SPIE

Volume 11371

Proceedings of SPIE 0277-786X, V. 11371

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

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 *International Workshop on Thin Films for Electronics, Electro-Optics, Energy, and Sensors 2019*, edited by Partha Banerjee, Karl Gudmundsson, Akhlesh Lakhtakia, Guru Subramanyam, Proceedings of SPIE Vol. 11371 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510635135

ISBN: 9781510635142 (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>

INTERNATIONAL WORKSHOP ON THIN FILMS FOR ELECTRONICS, ELECTRO-OPTICS, ENERGY AND SENSORS 2019

11371 02	Free lunches: Extending material properties by homogenization (Invited Paper) [11371-20]
11371 03	Artificial neural network to estimate the refractive index of a liquid infiltrating a chiral sculptured thin film in a sensor chip [11371-2]
11371 04	Why orthotropic friction is important on graphene and graphene fluoride thin films (Invited Paper) [11371-4]
11371 05	Bi-modal resonance and spectral characteristics of a thin chiral slab resonator on an achiral substrate using Fresnel coefficients [11371-5]
11371 06	Photoactive hybrid ZnO/ N-Ag -TiO₂ films for photocatalytic water purification: nanofibers vs nanorods (Invited Paper) [11371-19]
11371 07	Optoelectronically optimized colored thin-film CZTSSe solar cells [11371-22]
11371 08	Metal-insulator transition (MIT) actuators for microswitching applications (Invited Paper) [11371-23]
11371 09	Novel synthesis and design methods of optical thin film structures using vanadium dioxide phase change material (Invited Paper) [11371-37]
11371 0A	Design and fabrication of tunable inductors based on vanadium dioxide thin film (Invited Paper) [11371-46]
11371 0B	Fabrication of ZnS thin film using water bath method (Invited Paper) [11371-24]
11371 0C	TiO₂ films on CoFe₂O₄ nanoparticles for the photocatalytic oxidation of rhodamine B: influence of the alcoholic solutions [11371-28]
11371 0D	Study on spectral response characteristics of NEA GaAlAs/GaAs vacuum photodiode based on external electric field (Invited Paper) [11371-39]
11371 0E	Twisted light by a Kerr-like TiO₂ thin film with Au-Pt nanoparticles [11371-43]

- 11371 0F **Analysis of structure characteristics and internal electron diffusion characteristics of GaAs**
[11371-44]
- 11371 0G **Electronic structure and optical properties of native point defects on Si-doped GaN (0001)
surface (Invited Paper)** [11371-45]