## PROCEEDINGS OF SPIE

# Oxide-based Materials and Devices XV

David J. Rogers Ferechteh H. Teherani Editors

29 January – 1 February 2024 San Francisco, California, United States

Sponsored and Published by SPIE

Volume 12887

Proceedings of SPIE 0277-786X, V. 12887

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

Oxide-based Materials and Devices XV, edited by David J. Rogers, Ferechteh H. Teherani, Proc. of SPIE Vol. 12887, 1288701 © 2024 SPIE · 0277-786X · doi: 10.1117/12.3030432

Proc. of SPIE Vol. 12887 1288701-1

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 Oxide-based Materials and Devices XV, edited by David J. Rogers, Ferechteh H. Teherani, Proc. of SPIE 12887, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

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

ISBN: 9781510670341 ISBN: 9781510670358 (electronic)

Published by **SPIE** P.O. Box 10, Bellingham, Washington 98227-0010 USA Telephone +1 360 676 3290 (Pacific Time) SPIE.org Copyright © 2024 Society of Photo-Optical Instrumentation Engineers (SPIE).

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 fees. To obtain permission to use and share articles in this volume, visit Copyright Clearance Center 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.

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.



**Paper Numbering:** A unique citation identifier (CID) number is assigned to each article in the Proceedings of SPIE 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

vii	Conference Committee
	P-TYPE OXIDES
12887 02	Li-doped IrO <sub>2</sub> /Si heterojunctions for CMOS-integrated optoelectronics [12887-2]
12887 03	Nickel oxide hole transport layer engineering for mitigation of photo segregation in mixed halide organic-inorganic lead halide perovskites [12887-4]
	GALLIUM OXIDE I
12887 04	Split and unrelaxed Ga vacancies in $\beta$ -Ga <sub>2</sub> O <sub>3</sub> (Invited Paper) [12887-7]
	GALLIUM OXIDE II
12887 05	Thermal properties of $Ga_2O_3$ thin films and devices prepared on sapphire and SiC substrates by liquid-injection MOCVD (Invited Paper) [12887-12]
12887 06	Impacts of device processing on contact interfaces to (010) β-Ga <sub>2</sub> O <sub>3</sub> [12887-13]
	GALLIUM OXIDE III
12887 07	Crystal growth and power device applications of $\beta$ -Ga <sub>2</sub> O <sub>3</sub> (Invited Paper) [12887-16]
	GALLIUM OXIDE IV
12887 08	O-H centers in $\beta$ -Ga <sub>2</sub> O <sub>3</sub> with a Ga(1) vacancy at their core (Invited Paper) [12887-21]
	GALLIUM OXIDE V
12887 09	Heteroepitaxy and annealing studies of orthorhombic gallium oxide films on nanostructured AIN templates (Invited Paper) [12887-24]

	GALLIUM OXIDE VI
12887 0A	Chromium doped gallium oxide nanowire-based thermometer and the study of the anisotropic refractive index temperature dependence (Invited Paper) [12887-26]
12887 OB	Modeling of the gate leakage in MOSFETs with $Al_2O_3/\beta$ -Ga <sub>2</sub> O <sub>3</sub> gate stack (Invited Paper) [12887-29]
12887 OC	Heterogenous integration of gallium oxide with diamond and SiC (Invited Paper) [12887-30]
	VARIOUS OXIDES/APPLICATIONS I
12887 OD	Lithium niobate long-period waveguide gratings integrated with bismuth ferrite (BiFeO3) resistive random access memory [12887-31]
12887 OE	Material characterization of silicon dioxide cladding for photonic devices [12887-35]
	PHOTODETECTORS
12887 OF	Bismuth ferrite (BiFeO3)-based metal-semiconductor-metal photodetectors realized by the design of the experiments approach [12887-37]
	VARIOUS OXIDES/APPLICATIONS II
12887 0G	High quality ZnMgAlO thin films by ultrasonic spray pyrolysis: tuning of optoelectronic properties for use as TCO, window layer, and buffer layer in all-oxide solar cells [12887-42]
	VARIOUS OXIDES/APPLICATIONS V
12887 OH	Layer transfer technique of epitaxial rutile TiO2 thin films for photonic applications (Invited Paper) [12887-56]
	VARIOUS OXIDES/APPLICATIONS VI
12887 01	Plasma conduction mechanism in topological insulators [12887-57]
12887 OJ	Comparison of PLD-grown p-NiO/n-Ga <sub>2</sub> O <sub>3</sub> heterojunctions on bulk single crystal $\beta$ -Ga <sub>2</sub> O <sub>3</sub> and r-plane sapphire substrates [12887-3]

12887 0K The path to low temperature crack-free high refractive index inorganic thin films [12887-64]

#### **POSTER SESSION**

- 12887 OL A solution-processed p-type CuAlO<sub>2</sub> thin film and its applications in gas sensing at room temperature [12887-59]
- 12887 0M Chemically induced dynamic polarization by magnetic field on nanoionic photocatalysis via 2-propanol oxidation [12887-60]
- 12887 ON Superconducting crystal dense plasma parameters [12887-61]
- 12887 00 Comparative study of ZnO and WO<sub>3</sub> thin films grown by pulsed laser deposition at similar substrate temperatures [12887-62]
- 12887 OP Use of yttria-stabilised zirconia substrates for zinc oxide mediated epitaxial lift-off of superior yttria-stabilised zirconia thin films [12887-66]

### **Conference Committee**

#### Symposium Chairs

Ulrich T. Schwarz, Technische Universität Chemnitz (Germany) Karin Hinzer, University of Ottawa (Canada)

#### Symposium Co-chairs

Sonia M. García-Blanco, Universiteit Twente (Netherlands) Bernd Witzigmann, Friedrich-Alexander-Universität Erlangen-Nürnberg (Germany)

#### Program Track Chairs

James G. Grote, Photonics Engineering Consultant (United States) Shibin Jiang, AdValue Photonics, Inc. (United States)

#### Conference Chairs

David J. Rogers, Nanovation (France) Ferechteh H. Teherani, Nanovation (France)

#### Conference Program Committee

Vitaliy S. Avrutin, Virginia Commonwealth University (United States) Philippe Bove, Nanovation (France) James Connolly, Université Paris-Saclay (France) Nicolas de France, Université de Lille (France) Jean-Jacques Delaunay, The University of Tokyo (Japan) Aleksandra B. Djurišic, The University of Hong Kong (Hong Kong, China) Ian T. Ferguson, Kennesaw State University (United States) Adrián Hierro, Universidad Politécnica de Madrid (Spain) Seref Kalem, Bahçesehir University (Turkey) David C. Look, Wright State University (United States) Luna Lu, Purdue University (United States) Bianchi Méndez Martín, Universidad Complutense de Madrid (Spain) Norbert H. Nickel, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH (Germany) **Ümit Özgür**, Virginia Commonwealth University (United States) Seong-Ju Park, Gwangju Institute of Science and Technology (Korea, Republic of) Manijeh Razeghi, Northwestern University (United States) Vinod Eric Sandana, Nanovation (France) Michael L. Schuette, Air Force Research Laboratory (United States)

Cuong Ton-That, University of Technology, Sydney (Australia) Chris G. Van de Walle, University of California, Santa Barbara (United States)

Bruno Viana, Institut de Recherche de Chimie Paris (France) Markus R. Wagner, Technische Universität Berlin (Germany) Magnus Willander, Linköping Universitet (Sweden) Hideki Yamamoto, NTT Basic Research Laboratories (Japan)