## **PROCEEDINGS OF SPIE**

# Energy Harvesting and Storage: Materials, Devices, and Applications XI

Palani Balaya Achyut K. Dutta Sheng Xu Editors

12–16 April 2021 Online Only, United States

Sponsored and Published by SPIE

Volume 11722

Proceedings of SPIE 0277-786X, V. 11722

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 Energy Harvesting and Storage: Materials, Devices, and Applications XI, edited by Palani Balaya, Achyut K. Dutta, Sheng Xu, Proc. of SPIE 11722, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

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

ISBN: 9781510642812 ISBN: 9781510642829 (electronic)

Published by **SPIE** P.O. Box 10, Bellingham, Washington 98227-0010 USA Telephone +1 360 676 3290 (Pacific Time) SPIE.org Copyright © 2021 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

#### **ENERGY HARVESTING: SOLAR ENERGY**

- 11722 04 Micro/nanostructure-based selective absorber and emitter surfaces for high-efficiency solar thermophotovoltaic (STPV) applications (Invited Paper) [11722-1]
- 11722 06 The sensitized thermal cell: towards zero emissions of greenhouse gas (Invited Paper) [11722-3]
- Broadband mirrors with >99% reflectivity for thermophotovoltaic power conversion (Invited Paper) [11722-5]
- 11722 0A New organic semiconductor materials applied in transparent flexible organic photovoltaic solar cells [11722-7]

#### ENERGY STORAGE: MATERIALS AND DEVICES

11722 01 Mobile robot battery life estimation: battery energy use of an unmanned ground vehicle [11722-15]

#### ENERGY HARVESTING: THERMOELECTRIC MATERIALS

- 11722 0K Self-powered high energy laser detectors via thermoelectric generators [11722-17]
- 11722 0M Enhanced thermoelectric properties of 2D W xMo<sub>(1-x)</sub>S<sub>2</sub> alloys based vertical heterostructures for energy storage applications [11722-19]

#### ENERGY HARVESTING: MECHANICAL, ELECTRICAL, DIELECTRIC, PEIZOELECTRIC, ETC.

- 11722 0Q Asynchronous stochastic computing (ASC), asynchronous stream processing (ASP), and asynchronous impulse radio (AIR) for energy-harvested ubiquitous sensing at the edge [11722-23]
- 11722 OR Experimental study on drag characteristics of a horizontal axis double rotor wind turbine [11722-24]
- 11722 01 High surface area reverse electrowetting energy harvesting with power conditioning circuitry for self-powered motion sensors [11722-26]
- 11722 0V Geothermal energy as power producer [11722-28]