

PROCEEDINGS OF SPIE

# ***International Conference on Optoelectronic Information and Functional Materials (OIFM 2025)***

**Shahid Hussain  
Jupeng Ding**  
*Editors*

**18–20 April 2025  
Xi'an, China**

*Organized by*  
Changchun College of Electronic Technology (China)

*Sponsored by*  
AEIC—Academic Exchange Information Centre (China)

*Published by*  
SPIE

**Volume 13784**

Proceedings of SPIE 0277-786X, V. 13784

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 Conference on Optoelectronic Information and Functional Materials (OIFM 2025)*, edited by Shahid Hussain, Jupeng Ding, Proc. of SPIE 13784, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510694477

ISBN: 9781510694484 (electronic)

Published by

**SPIE**

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2025 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.

**SPIE. DIGITAL  
LIBRARY**

SPIEDigitalLibrary.org

---

**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

ix *Conference Committee*

## PHOTONIC MATERIALS AND DEVICES

---

- 13784 02 **Advances in moisture stability and water resistance of perovskite solar cells** [13784-11]
- 13784 03 **Preparation of photodegradant based on super-crosslinked polymers for plastic degradation and hydrogen evolution engineering** [13784-58]
- 13784 04 **The performance of polyacrylonitrile/carbon nanotubes fibers via electrospinning as a matrix film of flexible capacitive pressure sensors** [13784-72]
- 13784 05 **Quinoxaline redox species with two-electron reaction for aqueous organic redox flow batteries** [13784-78]
- 13784 06 **In situ growth of carbon nanotubes based on 2D Co/C nanosheets for high-efficiency microwave absorption** [13784-138]
- 13784 07 **Benzocyclobutene silicone resin with properties of low dielectric and high thermostability, and its composites** [13784-159]
- 13784 08 **Study and preparation on photodegradation properties of recycled low-density polyethylene plastic films** [13784-108]
- 13784 09 **Flash surface treatment of hot-pressed CsPbBr<sub>3</sub> wafer using 248nm KrF excimer laser enhances the performance of planar-type photodetector** [13784-19]
- 13784 0A **Molybdenum sulfide with abundant crystalline water as an anode for zinc ion hybrid capacitors** [13784-126]
- 13784 0B **Luminescence thermal stability improvement mechanism of Ba<sub>2</sub>SiO<sub>4</sub>: Eu<sup>2+</sup> with Mg<sup>2+</sup> cation substitution** [13784-28]
- 13784 0C **Improving performance of AlGaIn/AlN solar-blind ultraviolet phototransistors by gradient doping** [13784-68]
- 13784 0D **Transition metal-modulated electronic Pt-support interactions to enhance hydrogen evolution reaction** [13784-25]
- 13784 0E **Terahertz molecular fingerprint identification using quasi-bound states in the continuum** [13784-43]
- 13784 0F **Glassfiber-supported sulfur-doped TiO<sub>2</sub> with decomposition of benzene homologues for medium-density fiberboard** [13784-90]

- 13784 OG **Advances and trends of layered double hydroxide electrocatalysts for seawater splitting: visual analysis of bibliometrics based on Web of Science** [13784-20]
- 13784 OH **Amplitude control of beams at diffraction orders by phase-only metasurfaces** [13784-44]
- 13784 OI **Design and fabrication of modified waveguide spectral lens** [13784-29]
- 13784 OJ **Deep-level defect profiling in AlGaIn heterojunction phototransistors using low-frequency noise spectroscopy** [13784-34]
- 13784 OK **Active and tunable optical switch based on quasi-bound states in the continuum in phase-change metasurfaces** [13784-8]
- 13784 OL **High-Q chiral optical sensing via planar quasi-BIC metasurfaces** [13784-17]
- 13784 OM **Regulating electron transport layer to improve the photovoltaic performance for organic solar cells** [13784-14]
- 13784 ON **Application of ion-electron composite conductive hydrogels and their flexible electrodes/circuits** [13784-51]
- 13784 OO **Research on Au/Ge<sub>1-x</sub>Bi<sub>x</sub> Schottky diode-based near-infrared photodetectors with varying Bi doping** [13784-127]
- 13784 OP **Tentative demonstration of all-silicon photodetector: from near-infrared to mid-infrared** [13784-141]
- 13784 OQ **Study on the synthesis and photovoltaic properties of Znq<sub>2</sub> prepared by hydrothermal method** [13784-153]
- 13784 OR **Rydberg atom receiver enhanced by ENZ-GSP coupling: a theoretical design for quantum sensing** [13784-106]
- 13784 OS **Synthesis and optical properties of benzoselenadiazole-based non-fullerene acceptors** [13784-36]
- 13784 OT **Synthesis and photophysical properties of small-molecule donor materials for organic solar cells featuring a benzodithiophene core with phenylthio side chains and branched alkyl chain end groups** [13784-10]
- 13784 OU **Synthesis and photoelectric properties of new dimeric acceptors for organic solar cells** [13784-9]
- 13784 OV **Synergistic construction of ternary postprocessing-free organic solar cells using a volatile solid additive containing  $\sigma$ -hole and Y6 isomer** [13784-3]
- 13784 OW **Eu<sub>2</sub>O<sub>3</sub> doping enhances the photovoltaic conversion efficiency of solar cell cover glass** [13784-92]
- 13784 OX **Study on the PA-LaF<sub>3</sub>:Tb<sup>3+</sup>/PMMA for luminescent solar concentrators** [13784-88]

## OPTICAL SENSING AND COMMUNICATION

---

- 13784 0Y **A metal object detection method for electric vehicle wireless charging with ribbon-shaped bipolar detection coils** [13784-21]
- 13784 0Z **Selection of visible-near infrared spectral segments for space object detection** [13784-104]
- 13784 10 **Fabrication of tubular IPMC sensor for two-dimensional flow sensing** [13784-107]
- 13784 11 **Research on infrared spectroscopy detection of wood moisture content** [13784-46]
- 13784 12 **Underground backfill pipeline leakage monitoring system based on DAS and ECAPA-TDNN** [13784-62]
- 13784 13 **Research on miniaturized FBG-FP wireless demodulation system** [13784-111]
- 13784 14 **In situ detection system for contaminated sites based on multisensor fusion technology** [13784-69]
- 13784 15 **Measurement of trace H<sub>2</sub>O in SF<sub>6</sub> by TDLAS combined with filtering algorithms** [13784-151]
- 13784 16 **Analytical study of higher-order nonlinear effects on the steady-state optical solitons in optical fiber filled with cold atomic gases** [13784-13]
- 13784 17 **Passively mode-locked Er-doped fiber laser based on bismuth oxyselenide saturable absorber** [13784-95]
- 13784 18 **Design of Coriolis mass flowmeter drive circuit based on ZYNQ** [13784-26]
- 13784 19 **Finite element analysis on optical and electrical performance of IV-VI semiconductor MSM photodetectors** [13784-98]
- 13784 1A **Optimizing the performance of x-ray detectors through doping** [13784-57]
- 13784 1B **Design of offset-feed multibeam guidance with superimposed scanning for antenna systems** [13784-27]
- 13784 1C **Application of ICCEMDAN combined with dispersion entropy in bearing fault diagnosis** [13784-123]
- 13784 1D **A review of research progress in laser jamming and antijamming technology** [13784-30]
- 13784 1E **Construction of SERS substrates with highly sensitive bowl-like structure and its application in the detection of microplastics** [13784-41]

- 13784 1F **Process parameters analysis and artificial neural network prediction for color variation after laser-induced Ti-6Al-4V surface coloring** [13784-147]
- 13784 1G **Mixed cation perovskites applied in photoactive terahertz modulation with plasmon-induced transparency metamaterials** [13784-55]
- 13784 1H **Rational structural engineering of photochromism and photoluminescence in bipyridinium-based bifunctional systems** [13784-117]
- 13784 1I **Te doping InAs nanowires by molecular beam epitaxy** [13784-81]
- 13784 1J **Asymmetric polarization conversion transmissive metasurface in the visible spectrum** [13784-53]
- 13784 1K **Effects of different lattice parameters on the visible and infrared range of femtosecond laser filamentation supercontinuum spectrum** [13784-74]
- 13784 1L **Performance enhancement of AlGaN solar-blind field effect phototransistors via additional surface Schottky gate** [13784-94]
- 13784 1M  **$\text{Cu}_2(\text{OH})_2\text{CO}_3$  and CuO thin films obtained via chemical bath deposition: films preparation and gas sensing properties comparative study** [13784-118]
- 13784 1N **Application of carbon nanotube films in high-performance composite materials** [13784-48]
- 13784 1O **Research on task offloading minimizing energy consumption based on edge computing in Internet of Vehicles** [13784-75]
- 13784 1P **Preparation and electrothermal properties of G-CNT/PI flexible composite films** [13784-61]
- 13784 1Q **Research on LOCE optimization of solar thermal power generation system** [13784-158]
- 13784 1R **Research on variable arc beam processing of ITO conductive glass based on spatial light modulation** [13784-63]

---

#### FUNCTIONAL MATERIALS FOR ENERGY CONVERSION AND STORAGE

---

- 13784 1S **Molecular dynamics simulation of amorphous  $\text{SiO}_2$  cascade collisions** [13784-59]
- 13784 1T **Investigation of the effects of partial discharge on unsaturated polyester resin using LAMMPS molecular dynamics simulation** [13784-50]
- 13784 1U **Passive damping analysis of grid-connected filters** [13784-31]
- 13784 1V **Transformer-based inverters for wireless charging of electric vehicles with two isolated outputs** [13784-109]

- 13784 1W **The feed-forward extended state observer compensation on DC-bus voltage of hybrid distribution transformers** [13784-103]
- 13784 1X **Heat dissipation efficiency of battery module using liquid-cooled plate** [13784-24]
- 13784 1Y **Influence of the arrangement of ground heat exchanger on heat transfer performance: a case study of Songliao Basin in China** [13784-49]
- 13784 1Z **Numerical simulation of electric and flow fields of 8kA rare earth electrolyzer** [13784-35]
- 13784 20 **Microscopic and macroscopic structure of TEGDN propellants with different arc thicknesses** [13784-7]
- 13784 21 **Enhancement of the stability of IrRh40-Ir thermocouple via surface coating strategy** [13784-96]
- 13784 22 **Research on the combined process of magnetite powder flocculation and electrocatalytic oxidation for the treatment of transformer oil wastewater** [13784-73]
- 13784 23 **The effects of ammonium thiocyanate on the performance of tin-based perovskite LEDs** [13784-18]
- 13784 24 **Study on the impact of homogeneous doping on the sintering activity and conductivity of YSZ** [13784-6]
- 13784 25 **A study on the design and calculation of a flexible curved inverted-F antenna adapted to bending deformation** [13784-128]
- 13784 26 **Reliability analysis of PCB component assembly process based on Go method** [13784-83]
- 13784 27 **Research on measurement traceability of small force values based on the principle of electromagnetic force balance** [13784-97]
- 13784 28 **Transparent packaging adhesive for flexible printed circuit boards in the context of artificial intelligence** [13784-84]
- 13784 29 **Flexible thin film thermopiles based on in situ metal growth on polyimide substrate** [13784-5]
- 13784 2A **Research on benchmarking of physical vapor deposition (PVD coating) equipment** [13784-70]
- 13784 2B **Structural design, assembly, and adjustment method of cylindrical lens for spaceborne limb sounding** [13784-114]
- 13784 2C **Research on space laser 3D point cloud data registration technology** [13784-91]
- 13784 2D **Research on stiffness testing method based on laser tracker** [13784-54]

- 13784 2E **Experimental investigation of curing shrinkage in ceramic vat photopolymerization using response surface methodology** [13784-113]
- 13784 2F **Research progress and challenges in the mechanical properties of lithium-ion batteries** [13784-38]
- 13784 2G **XGBoost-Bayesian prediction model for two-dimensional MoS<sub>2</sub> preparation** [13784-105]
- 13784 2H **Numerical simulation study on particle deposition on wafer surfaces** [13784-149]
- 13784 2I **Effect of CTAB on the structure and luminescence properties of Yb-doped ZnO** [13784-15]
- 13784 2J **The research evolution of machine learning-driven material design optimization: hot trends and future challenges from a bibliometric perspective** [13784-37]
- 13784 2K **Corrosion resistance process and performance of automobile chassis coatings** [13784-2]
- 13784 2L **Measurement and characterization of AlN thin films on patterned sapphire substrates based on x-ray diffraction (XRD) method** [13784-60]
- 13784 2M **Identifying the magnetic properties of Ni-doped two-dimensional WS<sub>2</sub>** [13784-71]
- 13784 2N **Correlation between crystallinity and luminescent properties in solvated fullerene solutions** [13784-64]