

PROCEEDINGS OF SPIE

# ***Infrared Technology and Applications XLVI***

**Bjørn F. Andresen  
Gabor F. Fulop  
John Lester Miller  
Lucy Zheng**  
*Editors*

**27 April – 8 May 2020  
Online Only, United States**

*Sponsored and Published by  
SPIE*

**Volume 11407**

Proceedings of SPIE 0277-786X, V. 11407

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

11407 15 **Range infrared detector issues in the SWAPc and pitch reduction context** [11407-22]

---

**UNCOOLED FPA AND APPLICATIONS**

---

11407 17 **Room temperature long-wavelength infrared graphene photodetectors using photogating via the pyroelectric effect** [11407-24]

11407 18 **Middle wavelength infrared graphene photodetectors with low dark-current and high responsivity** [11407-25]

11407 19 **640 x 480 17  $\mu\text{m}$  microbolometer uncooled detector development at ASELSAN, Inc.** [11407-26]

11407 1A **Development of new pixel structure for beyond 12- $\mu\text{m}$  pixel pitch SOI diode uncooled IRFPAs (Invited Paper)** [11407-27]

11407 1D **Cross polarimetric thermal-to-visible heterogeneous face recognition by coupled dictionary learning** [11407-30]

---

**POSTER SESSION**

---

11407 1F **Developing a new class of innovative high performance optical infrared imagers** [11407-67]

11407 1H **Absorption mode control of plasmonic metasurfaces for high-performance wavelength, or polarization-selective uncooled infrared sensors** [11407-71]

11407 1I **Multilayer graphene metamaterial absorbers for high-performance middle- to long-wavelength infrared detection** [11407-72]

11407 1J **First-principles calculation of electronic structure of turbostratic graphene for high-responsivity infrared detection with enhanced photogating** [11407-73]

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 [SPIDigitalLibrary.org](http://SPIDigitalLibrary.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 *Infrared Technology and Applications XLVI*, edited by Bjørn F. Andresen, Gabor F. Fulop, John Lester Miller, Lucy Zheng, Proceedings of SPIE Vol. 11407 (SPIE, Bellingham, WA, 2020) Seven-digit Article CID Number.

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510635913

ISBN: 9781510635920 (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](http://SPIE.org)

Copyright © 2020, 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](http://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/20/\$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**

[SPIDigitalLibrary.org](http://SPIDigitalLibrary.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

---

## NIR / SWIR I

---

- 11407 04 **Low dark current designs for mesa type SWIR photodetectors** [11407-4]
- 11407 06 **Exploration of uncooled quantum infrared detectors based on quantum dots/graphene heterostructures (Invited Paper)** [11407-7]
- 11407 07 **Extended SWIR high performance and high definition colloidal quantum dot imagers** [11407-8]
- 11407 08 **Image sensors for low cost infrared imaging and 3D sensing (Invited Paper)** [11407-9]

---

## NIR / SWIR II

---

- 11407 0A **Extended SWIR InGaAs/GaAsSb type-II superlattice photodetector on InP** [11407-33]
- 11407 0C **Low capacitance SWIR photodetectors for high speed sensing applications** [11407-35]

---

## LARGE SUBSTRATES AND ADVANCED ROICs

---

- 11407 0E **High density integrated isolated deep silicon vias in silicon for 3D-ROIC FPA architectures** [11407-37]
- 11407 0F **Large format multi-wafer production of LWIR photodetector structures on 150mm GaSb substrates by MBE** [11407-38]
- 11407 0G **From 5" CdZnTe ingots to high quality (111) CdZnTe substrates for SWIR 2K<sup>2</sup> 15  $\mu$ m pitch infrared focal plane arrays manufacturing** [11407-39]

---

## T2SL / HOT I

---

- 11407 0I **Determination of background doping type in type-II superlattice using capacitance-voltage measurements with double mesa structure (Invited Paper)** [11407-42]
- 11407 0K **Metastructures for VLWIR SLS detectors (Invited Paper)** [11407-45]

---

**T2SL / HOT II**

---

- 11407 OM **Modeling and extraction of optical characteristics of InAs/GaSb strained layer superlattice (Rising Researcher Paper)** [11407-48]
- 11407 ON **Extension of resonant cavity-enhanced photodetection into the MWIR and LWIR ranges using a Ga-free type-II strained-layer superlattice** [11407-52]
- 11407 OP **Type-II superlattice SWaP IDCCA production at IRnova (Invited Paper)** [11407-54]
- 11407 OQ **III-V based infrared detectors are imposing new standards** [11407-55]

---

**T2SL / HOT III**

---

- 11407 OT **Sb-based third generation at Center for Quantum Devices (Invited Paper)** [11407-59]

---

**A WORD FROM THE MASTER**

---

- 11407 OV **Comparison of performance limits of HOT HgCdTe photodiodes and colloidal quantum dot infrared detectors (Invited Paper)** [11407-61]

---

**HGCDTE**

---

- 11407 OX **Law 19: The ultimate photodiode performance metric (Invited Paper)** [11407-66]

---

**APPLICATIONS ENABLED BY ADVANCED IR TECHNOLOGIES**

---

- 11407 OZ **Electronics for the detectors of SOFIA's next generation instrument: the High-Resolution Mid-infrared Spectrometer (HIRMES)** [11407-12]
- 11407 10 **Molecular-dynamics simulated nerve agent-sorbent binding for interpretation of ATR spectra** [11407-13]

---

**IRST/DAS**

---

- 11407 12 **Wide-area infrared imaging with computational pixel imagers (Invited Paper)** [11407-17]
- 11407 13 **Detect and avoid function for UAVs: presentation of an EO/IR sensor solution** [11407-18]