

PROCEEDINGS OF SPIE

# ***Optical Components and Materials XVI***

**Shibin Jiang**  
**Michel J. F. Digonnet**  
*Editors*

**4–6 February 2019**  
**San Francisco, California, United States**

*Sponsored and Published by*  
SPIE

**Volume 10914**

Proceedings of SPIE 0277-786X, V. 10914

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 [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 *Optical Components and Materials XVI*, edited by Shubin Jiang, Michel J. F. Digonnet, Proceedings of SPIE Vol. 10914 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510624702

ISBN: 9781510624719 (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 © 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 \$18.00 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/19/\$18.00.

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

vii	<i>Authors</i>
xi	<i>Conference Committee</i>

---

## RARE-EARTH DOPED MATERIALS I

---

10914 03	<b>1.5<math>\mu</math>m persistent luminescence of Er<sup>3+</sup> in Gd<sub>3</sub>Al<sub>5-x</sub>Ga<sub>x</sub>O<sub>12</sub> (GAGG) garnets via persistent energy transfer (Invited Paper) [10914-2]</b>
10914 05	<b>High-power fiber laser materials: influence of fabrication methods and codopants on optical properties [10914-4]</b>
10914 06	<b>405-nm pumped Ce<sup>3+</sup>-doped silica fiber for broadband fluorescence from cyan to red [10914-5]</b>

---

## METAMATERIALS

---

10914 09	<b>Nanoimprinted nanocomposite membrane-type metamaterials [10914-8]</b>
10914 0A	<b>Arsenic selenide dielectric metasurfaces [10914-9]</b>

---

## SILICON PHOTONICS

---

10914 0B	<b>Si photonics using micron-size waveguides (Invited Paper) [10914-10]</b>
----------	---

---

## SENSORS

---

10914 0F	<b>Substrate requirements to enable durability and accuracy in structured-light-based 3D sensing [10914-14]</b>
----------	---

---

## GRATINGS

---

10914 0J	<b>Low-loss and robust DWDM Echelle grating (de-)multiplexers in SOI technology [10914-18]</b>
10914 0K	<b>Bloch surface wave excitation using a maximum length sequence grating structure [10914-19]</b>

10914 0L **Ytterbium-doped nanostructured core silica fiber with built-in Bragg grating for laser applications** [10914-20]

---

#### NANOMATERIALS

---

10914 0R **Analysis of upconversion nanoparticles as an active medium for upconversion light sources** [10914-26]

10914 0S **Phase-dependent emission of  $\text{KLaF}_4:\text{Nd}^{3+}$  nanocrystals in oxyfluoride glass-ceramics** [10914-27]

10914 0T **Site symmetry and host sensitization-dependence of  $\text{Eu}^{3+}$  real-time luminescence in tin dioxide nanoparticles (Invited Paper)** [10914-28]

---

#### OPTICAL GLASSES, FIBERS, AND WAVEGUIDES

---

10914 0V **Optical glass: refractive index homogeneity from small to large parts - an overview** [10914-30]

10914 0X **Fabrication of high optical quality Ge-As-Se glasses for the development of low-loss microstructured optical fibers** [10914-32]

10914 0Y **Novel approach for high-performance optical fibers: multiple-doped silica powders with plasma-enhanced processes** [10914-33]

10914 0Z **Optical properties and long-term stability of unclad single crystal sapphire fiber in harsh environments** [10914-34]

10914 10 **Flexible waveguides with amorphous photonic materials** [10914-35]

---

#### RARE-EARTH DOPED MATERIALS II

---

10914 11  **$\text{SiO}_2\text{-SnO}_2$  transparent glass-ceramics activated by rare earth ions (Invited Paper)** [10914-36]

10914 12 **Small short-wavelength optical isolator using  $\text{Tb}^{3+}$ -rich magneto-optical glass** [10914-37]

---

#### DETECTORS

---

10914 15 **Linearity characterization of high performance SWIR photodetectors from various materials** [10914-40]

10914 16 **Advances on photoconductive InAs/GaSb type-II superlattice long-wavelength infrared detectors for high operating temperature** [10914-41]

- 10914 17 **Metal semiconductor metal photodiodes based on all-epitaxial Ge-on-insulator-on- Si(111), grown by molecular beam epitaxy** [10914-42]
- 10914 18 **Ultrafast response vertical phototransistors based on hybrid perovskite** [10914-43]
- 10914 19 **Solution-possessed vertical photodetectors based on composition-dependent cesium lead halide (CsPbX<sub>3</sub>, X = Cl, Br, and I) perovskite quantum dots** [10914-44]
- 10914 1A **Metal-semiconductor-metal photodetectors on a GeSn-on-insulator platform** [10914-45]

---

#### DEVELOPMENT OF OPTICAL COMPONENTS

---

- 10914 1B **Super broadband achromatic lenses extending from the visible to the mid-infrared** [10914-46]
- 10914 1E **Automated sprue removal from injection moulded micro-optics with ultrasonic cutting** [10914-50]
- 10914 1F **Optics with diamond-like-carbon overcoat (DOC) provide improved optical performance over traditional DLC films and better cleanability than standard PVD coatings** [10914-51]

---

#### POSTER SESSION

---

- 10914 1H **Compositional dependence of the emission color of sodium borate glasses embedded with inorganic ions under diode laser excitation** [10914-53]
- 10914 1I **First-principle calculations of Debye temperature of optoelectronic LiGaS<sub>2</sub> and LiGaSe<sub>2</sub> semiconductors under different pressures** [10914-54]
- 10914 1J **Numerical investigation on local confinement of infrared light in chalcogenide transversely disordered optical fibers** [10914-57]
- 10914 1K **Diamond gratings used for high-power laser system** [10914-58]
- 10914 1M **Structure optimization of KTa<sub>1-x</sub>Nb<sub>x</sub>O<sub>3</sub> varifocal lens** [10914-60]
- 10914 1N **Monitoring the purification of tobacco smoke in air assisted by ZnO nanowires and using MEMS-FTIR spectrometer for online continuous analysis of volatile organic compounds (VOCs)** [10914-61]
- 10914 1O **Tailoring bandgap transmission spectra of new neodymium-doped tellurite all-solid photonic bandgap fibers with double cladding layers** [10914-62]
- 10914 1R **Single-mode large-mode-area Er-Yb fiber** [10914-65]
- 10914 1S **3D printing optical devices based on silicone optical technology (SOT) and its application on analytical chemistry** [10914-66]

- 10914 1U **Optical properties of partially hydrogenated graphene using first-principle calculations** [10914-70]
- 10914 1V **Coating geometry measurement of specialty fiber with dark-field illumination technique** [10914-71]
- 10914 1W **Diffractive optical elements investigation in the phase domain** [10914-72]
- 10914 1X **Novel optical gas sensor based on photonic crystal fiber** [10914-73]
- 10914 1Z **Design of long-range hybrid plasmonic waveguides** [10914-77]
- 10914 20 **Multi-wavelength erbium-doped fiber ring lasers based on an optical fiber tip interferometer** [10914-78]
- 10914 23 **The sealed, the athermaled, and the rugged: the wild west of modified opto-mechanical design** [10914-82]
- 10914 24 **High-efficiency Ge-on-Si SPADs for short-wave infrared** [10914-84]
- 10914 25 **Temperature cross-sensitivity compensation in liquid level sensor using Mach-Zehnder interferometers** [10914-56]