

# PROCEEDINGS OF SPIE

## ***Micro-Structured and Specialty Optical Fibres VI***

**Kyriacos Kalli**  
**Pavel Peterka**  
**Christian-Alexander Bunge**  
*Editors*

**6–10 April 2020**  
**Online Only, France**

*Sponsored by*  
SPIE

*Cosponsored by*  
City of Strasbourg (France)  
Eurometropole (France)  
CNRS (France)  
Région Grand Est (France)  
iCube (France)  
Université de Strasbourg (France)

*Cooperating Organisations*  
Photonics 21 (Germany)  
EOS—European Optical Society (Germany)  
Photonics Public Private Partnership (Belgium)  
Photonics France (France)

*Published by*  
SPIE

**Volume 11355**

Proceedings of SPIE 0277-786X, V. 11355

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 *Micro-Structured and Specialty Optical Fibres VI*, edited by Kyriacos Kalli, Pavel Peterka, Christian-Alexander Bunge, Proceedings of SPIE Vol. 11355 (SPIE, Bellingham, WA, 2020) Seven-digit Article CID Number.

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510634824

ISBN: 9781510634831 (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

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

---

## FIBER GRATINGS AND POLYMER OPTICAL FIBERS

---

11355 02	<b>Femtosecond laser written long period grating in a multimode CYTOP polymer fibre (Invited Paper) [11355-1]</b>
11355 03	<b>Advanced concrete optical remote sensors: structural health monitoring of concrete buildings using polymer sensors [11355-2]</b>
11355 04	<b>Laser-induced degradation and damage morphology in polymer optical fibers [11355-3]</b>
11355 05	<b>Graphene-oxide coated LPGs for humidity sensing applications [11355-4]</b>
11355 06	<b>Systematic investigation of modified melt spinning manufacturing parameters on the structural properties of graded index polymer optical fibers [11355-5]</b>

---

## PHOTONIC CRYSTAL FIBERS AND HOLLOW-CORE FIBERS

---

11355 08	<b>Silica microstructure-based optical fiber activated by YAG:Nd<sup>3+</sup> nanocrystals [11355-32]</b>
----------	---

---

## 2-MICRON FIBER LASERS: JOINT SESSION I

---

11355 09	<b>Advances in two-micron lasers for nonlinear conversion into the mid-IR (Invited Paper) [11355-10]</b>
----------	--

---

## ACTIVE FIBERS FOR 2-MICRON FIBER LASERS: JOINT SESSION II

---

11355 0C	<b>Holmium-doped optical fibers for efficient fiber lasers [11355-13]</b>
----------	---

---

## MODELLING AND TESTING OF SPECIALTY FIBERS AND COMPONENTS

---

11355 0E	<b>Monte-Carlo simulation model for polymer optical fiber fabrication: influence of parameters such as the cooling rate, pressure and polymer chain length on the optical and mechanical properties[11355-14]</b>
----------	---

- 11355 OG **High frequency in-core acousto-optic modulation of a suspended core optical fibre** [11355-16]
- 11355 OI **Spatially multiplexed multicore fiber communication to fuel the next information revolution**  
[11355-18]

---

#### OPTICAL FIBERS FOR BIOMEDICAL APPLICATIONS

---

- 11355 OK **Microstructured electrodes on optical fibers for biomedical applications** [11355-20]
- 11355 OL **Fabrication and characterization of step-index biocompatible and biodegradable polyesters based optical fiber** [11355-21]
- 11355 ON **Femtosecond laser inscribed Mach-Zehnder interferometer: a compound all-in-fiber versatile sensing device** [11355-23]

---

#### SENSORS AND TELECOMMUNICATION DEVICES BASED ON OPTICAL FIBERS

---

- 11355 OO **Micro-structured optical multi-mode fibers for sensing applications (Invited Paper)** [11355-24]
- 11355 OP **Scope and application of bi-directional EDFA for long distance optical transmissions** [11355-25]
- 11355 OQ **Bismuth-doped power amplifier in the spectral region between 1650 nm and 1700 nm**  
[11355-26]
- 11355 OR **Selective liquid filling of photonic crystal fibers using two-photon polymerization lithography without post-exposure development** [11355-28]

---

#### POSTER SESSION

---

- 11355 OT **Silicon based integrated hollow waveguide for gas sensing applications** [11355-29]
- 11355 OV **Dynamics of the whispering gallery modes at the surface of the optical fiber near its facet**  
[11355-31]
- 11355 OW **Numerical modelling of pump absorption in coiled and twisted double-clad fiber: a prospect for tandem pumped fiber laser** [11355-33]
- 11355 OX **Multimode CYTOP fiber interferometric response to laser wavelength scanning** [11355-34]
- 11355 OY **Laguerre-Gauss beams with polarization-OAM entanglement in a graded-index fiber**  
[11355-35]

- 11355 0Z **Interrogation of SMS for measuring of temperature and strain using half-etched FBG with enhanced sensitivity** [11355-36]
- 11355 10 **Adhesive assisted fabrication of chirped POF Bragg grating** [11355-37]
- 11355 11 **Phase-shifted Bragg grating inscription in photonic crystal fibers by UV phase mask beam stop technique** [11355-38]
- 11355 13 **Detection of water, oil and oil contamination in water using chirped fiber Bragg gratings inscribed in CYTOP fibers** [11355-40]