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Front Matter: Volume 11773

, "Front Matter: Volume 11773," Proc. SPIE 11773, Micro-structured and Specialty Optical Fibres VII, 1177301 (13 May 2021); doi: 10.1117/12.2599011

SPIE.

Event: SPIE Optics + Optoelectronics, 2021, Online Only

PROCEEDINGS OF SPIE

Micro-structured and Specialty Optical Fibres VII

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Editors

19–23 April 2021
Online Only, Czech Republic

Sponsored by
SPIE

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ELI Beamlines (Czech Republic)
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European Optical Society
HiLASE Centre (Czech Republic)

Published by
SPIE

Volume 11773

Proceedings of SPIE 0277-786X, V. 11773

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

Micro-structured and Specialty Optical Fibres VII, edited by Kyriacos Kalli, Alexis Mendez, Pavel Peterka,
Proc. of SPIE Vol. 11773, 1177301 · © 2021 SPIE · CCC code: 0277-786X/21/\$21 · doi: 10.1117/12.2599011

Proc. of SPIE Vol. 11773 1177301-1

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Please use the following format to cite material from these proceedings:

Author(s), "Title of Paper," in *Micro-structured and Specialty Optical Fibres VII*, edited by Kyriacos Kalli, Alexis Mendez, Pavel Peterka, Proc. of SPIE 11773, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510643802

ISBN: 9781510643819 (electronic)

Published by

SPIE

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

Telephone +1 360 676 3290 (Pacific Time)

[SPIE.org](https://spie.org)

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Introduction

This proceedings volume is from *Micro-structured and Specialty Optical Fibres VII*, held on Monday – Friday 19–23 April 2021, at the SPIE Optics+Optoelectronics Digital Forum. The conference could not be held in person in Prague, Czech Republic, as originally planned, due to epidemiologic measures adopted against spreading of COVID-19 pandemic. The conference was collocated with the special events of the virtual lab tour in the optical fibre technology laboratory at the Institute of Photonics and Electronics of the Czech Academy of Sciences and notably the live events of the Optical Fiber Technology Workshop followed by Topical Discussion Forum for the Optical Fiber Technology Sessions and that were organized on Thursday 22 April 2022.

Left photo: The conference was collocated with the Optical Fiber Technology Workshop organized by Ivan Kašik (photo on the left) with four experts as speakers of tutorials and invited talks, see upper row photos on the right figure. From left: Anirban Dhar, Ryszard Buczynski, Pavel Honzátko and Alexis Mendez.

This conference aims to provide a forum for scientists and engineers-involved with the modelling, design, fabrication, device integration, and application of PCFs and specialty optical fibres-to present and share their latest research and findings. Moreover, this conference expands on the existing innovations that relate to microstructure and specialty optical fibres, detailing progress in the areas of fibre manufacture, devices, and applications that target the fields of optical communications, fibre lasers, sensing and spectroscopy; and incorporating modelling of novel fibre geometries. Papers were focused mainly on the following topics:

- **Materials, Processes and Fabrication Advances** Advances in speciality and microstructure fibre manufacture based on, silica, chalcogenide and multi-component glasses, rare-earth doped fibres, single crystal material fibre and polymer optical fibres, as well as new and advanced coating materials.
- **Theory and Modeling** Modelling and simulation of linear and nonlinear characteristics of novel optical fibres, including modal analysis, birefringence, polarisation and dispersion properties, confinement and bending losses, evanescent coupling in multi-core fibre and fibre tapers.

- **Test & Characterisation Methods** Characterisation of optical fibres, e.g. measurements of fibre geometry, birefringence, dispersion, non-linearity and distributed measurements
- **Optical Components, Sensors and Devices** Speciality and microstructure fibre-based devices and their applications cover a broad spectrum of research areas that can include: Supercontinuum generation, wavelength conversion, **fibre lasers** and amplification, **ultra-high power and ultra-short pulse delivery**, optical clocks, pulse shaping, dispersion compensation, micro fluidic devices, liquid crystal fibres, and optical transport of microparticles, **optical fibre sensors**, e. g. chemical and biosensors, vectorial (multi-core structures) and birefringent sensors (temperature and pressure); Bragg and long period grating sensors in specialised fibres; near-field microscopy, spectroscopy of gases and liquids.

This seventh bi-annual conference this year displayed 41 papers, 33 of them were presented in 6 oral sessions and 8 of them in a poster session. Here are the invited talks of the program:

Yazhou Wang, Technical Univ. of Denmark (Denmark); Ultraviolet to mid-infrared gas-filled anti-resonant hollow-core fiber lasers

Markus A. Schmidt, Leibniz-Institut für Photonische Technologien e.V. (Germany), Optofluidic fiber-based nanoparticle tracking analysis: tool to characterize diffusing nanoscale specimen such as SARS-CoV-2

Radan Slavik, Optoelectronics Research Ctr. (United Kingdom); Unusual properties of hollow-core fibres (Invited Paper)

Mikhail E. Likhachev, A. M. Prokhorov General Physics Institute (Russian Federation); Active tapered fibers for high peak power fiber lasers (Invited Paper)

Ryszard Buczynski, Institute of Electronic Materials Technology (Poland), Univ. of Warsaw (Poland), Nanostructured active and photosensitive fibres for laser applications (Invited Paper)

Jaesun Kim, Taihan Fiberoptics Co., Ltd. (Korea, Republic of); Novel fabrication technology for active gain fibers (Invited Paper)

Slawomir Sujecki, Wroclaw University of Science and Technology (Poland) and The Univ. of Nottingham (UK); Application of fluoride fiber laser devices operating at wavelengths near 3 micrometers (Invited Paper)

Optical Fiber Technology Workshop, the collocated industry event, contained a series of tutorial and invited lectures focused on advanced fabrication methods of optical fibers and optical fiber components. Registered participants were invited to visit a virtual lab tour in the laboratory for fabrication of specialty optical fibres for fibre lasers and optical fibre sensors, part of the Institute of Photonics and Electronics (ÚFE) of the Czech Academy of Sciences. List of lectures from the Workshop:

Anirban Dhar, Central Glass and Ceramic Research Institute-CSIR (India), Fabrication technology for specialty silica optical fiber using MCVD process (Tutorial)

Ryszard Buczynski, Lukaszewicz Research Network - Institute of Microelectronics and Photonics, and University of Warsaw, (Poland), Prospects for development of nanostructured free-form optical fibers (Invited Paper)

Pavel Honzátko, Institute of Photonics and Electronics of the Czech Academy of Sciences (Czech Republic), Current trends in optical fibers (Invited Paper)

Alexis Mendez, MCH Engineering LLC (United States), Biomedical applications of optical fibers and fiber sensors

Despite the difficulties imposed by the pandemic that forced the event into an online format, this seventh bi-annual conference brought a record number of papers to the conference. It continued to serve as viable means for sharing ideas and research results in the area of specialty optical fibers and their applications in fibre lasers, optical fibre sensors, telecommunications, biomedicine and other important human activities. We hope you will enjoy the papers submitted for this volume.

Kyriacos Kalli
Alexis Mendez
Pavel Peterka