PROCEEDINGS OF SPIE

Optical Waveguide and Laser Sensors IV

Robert A. Lieberman Glen A. Sanders Michael P. Buric Editors

15–17 April 2025 Orlando, Florida, United States

Sponsored and Published by SPIE

Volume 13467

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 Optical Waveguide and Laser Sensors IV, edited by Robert A. Lieberman, Glen A. Sanders, Michael P. Buric, Proc. of SPIE 13467, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510687233

ISBN: 9781510687240 (electronic)

Published by

SPIF

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.



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

v Conference Committee

	FIBER OPTIC INTERROGATOR TECHNOLOGIES AND DISTRIBUTED SENSING
13467 02	Efficient signal processing in BOTDA: utilizing PCA and PCA-based neural networks for temperature monitoring [13467-1]
13467 03	Numerical investigation of distributed fiber optic sensor installations for flexural guided wave-based NDE [13467-2]
13467 04	Microwave photonics-enabled high-sensitivity demodulation of optical fiber Fabry-Perot interferometer sensors [13467-6]
13467 06	Enhancing the value of low-cost optical fiber gas sensors via machine learning (Invited Paper) [13467-8]
	FIBER OPTIC SENSORS FOR INFRASTRUCTURE MONITORING I
13467 07	Pilot-scale validation of distributed optical fiber sensors for underground pipeline monitoring [13467-9]
13467 08	Domain-adapted deep learning for enhanced pipeline monitoring using guided waves and fiber optic sensing [13467-10]
13467 09	Fusion of experiments and simulations for real-time identification of pipeline defects [13467-11]
	FIBER OPTIC SENSORS FOR INFRASTRUCTURE MONITORING II
13467 OB	Partial canister mockup monitoring using fiber optic acoustic sensors and ultrasonic excitation [13467-13]
13467 OC	Improving stability of an optical fiber pH sensor with a calcined polyethylenimine-coating at high pressures and temperatures [13467-14]
13467 0D	High-sensitivity measurement of ultrasonic waves with FBG sensors (Invited Paper) [13467-15]

HARSH ENVIRONMENT SENSORS AND SENSORS IN ENERGY APPLICATIONS 13467 OE Multimode interferometric optical fiber sensors with polymer-magnetic nanoparticle coatings for magnetic field sensing [13467-16] Low-cost multi-channel fiber optic interrogator for electric power grid applications 13467 OF [13467-18] 13467 0G Real-time hydrogen gas blend composition measurement with waveguide-enhanced Raman gas analyzer [13467-19] 13467 OH Resonant photoacoustic sensors enhanced by differential measurement and multi-pass gas cells for trace methane detection [13467-20] **NOVEL WAVEGUIDES FOR SENSING** 13467 OJ Segregation of chromium and titanium in sapphire optical fiber grown via the laser-heated pedestal growth technique [13467-23] 13467 OK Anti-resonant hollow-core fiber design and optimization with particle swarm optimization **algorithm** [13467-24] 13467 OM Comparison of SM optical fibers for distributed acoustic sensing (Invited Paper) [13467-26] **DIGITAL POSTER SESSION** 13467 ON Design and modeling of a fiber optic multimodal sensing system for simultaneous measurement of multiple parameters [13467-3] Fabrication and testing of a fiber optic multimodal sensing system for simultaneous 13467 00 measurement of multiple parameters [13467-4]