

PROCEEDINGS OF SPIE

# ***Smart Biomedical and Physiological Sensor Technology XVI***

Brian M. Cullum  
Douglas Kiehl  
Eric S. McLamore  
*Editors*

**15–16 April 2019**  
**Baltimore, Maryland, United States**

*Sponsored and Published by*  
SPIE

**Volume 11020**

Proceedings of SPIE 0277-786X, V. 11020

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 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 *Smart Biomedical and Physiological Sensor Technology XVI*, edited by Brian M. Cullum, Douglas Kiehl, Eric S. McLamore, Proceedings of SPIE Vol. 11020 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510627055

ISBN: 9781510627062 (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

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**

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

v	Authors
vii	Conference Committee

## SESSION 1 NOVEL MATERIALS FOR SMART SENSING

---

11020 02	Dielectric properties of $\text{CaCu}_{3-x}\text{Mg}_x\text{Ti}_4\text{O}_{12}$ ( $x=0.20$ and $0.50$ ) material synthesized by the semi-wet route for energy storage capacitor (Invited Paper) [11020-1]
11020 03	Mushroom Biotechnology: the rise of the fallen (Invited Paper) [11020-2]
11020 05	Importance of lotus effect on surface sensing [11020-4]
11020 06	Effect of processing on morphology of hydroxyapatites: bioactive glasses and crystalline composites [11020-5]

## SESSION 2 BIOSENSING TECHNIQUES ON THE HORIZON

---

11020 08	Quantitative laser speckle contrast imaging for presentation attack detection in biometric authentication systems [11020-7]
11020 09	Thermally-induced optical reflection of sound (THORS) for photoacoustic sensing [11020-8]
11020 0A	Determining driver nodes in dynamic signed biological networks [11020-9]
11020 0B	Topographic imaging of an absorbing object in a tissue-like scattering medium using a single source-detector pair [11020-10]

## SESSION 3 BIORECOGNITION/BIOREACTIVE PLATFORMS FOR SENSING

---

11020 0E	Development of army relevant integrated photonics MIP platform [11020-13]
11020 0G	Electric fields assisted fluorescence enhancement for microRNA biomarker detection in serum samples: strategies for combating cancer, obesity and addiction to opioid (Invited Paper) [11020-15]
11020 0H	Guided-mode resonance sensing of neuropeptide-Y with a sandwich assay achieving pg/mL detection (Invited Paper) [11020-16]

---

**SESSION 4      PATHOGEN SENSING/FOOD MONITORING**

---

11020 0K      **Model reduction of structural biological networks by cycle removal** [11020-19]

---

**SESSION 5      RECENT ADVANCES IN WEARABLES**

---

11020 0M      **Ruggedized peptide receptors for soldier health and performance monitoring** [11020-21]

11020 0N      **Printable transistors for wearable sweat sensing (Invited Paper)** [11020-22]

11020 0O      **Predicting limits of detection in real-time sweat-based human performance monitoring**  
[11020-23]

11020 0P      **Electronic tattoos: the most multifunctional but imperceptible wearables** [11020-24]

11020 0Q      **Blast wave sensing from flexible piezoelectric materials** [11020-25]

11020 0R      **Smart wristband with integrated chemical sensors for detecting glucose levels using breath  
volatile organic compounds** [11020-26]

---

**SESSION 6      TOWARDS THE CLINIC/HOME**

---

11020 0T      **Flexible polyimide based 34-channel electrode arrays for mouse EEG measurement** [11020-28]

11020 0V      **Recognition of imagined speech using electroencephalogram signals** [11020-30]

---

**POSTER SESSION**

---

11020 0Z      **Effect of coil size on transcranial magnetic stimulation (TMS) focality** [11020-38]