## PROCEEDINGS OF SPIE

## Nano-, Bio-, Info-Tech Sensors, and 3D Systems II

**Vijay K. Varadan** Editor

5–7 March 2018 Denver, Colorado, United States

Sponsored by SPIE

Cosponsored by
OZ Optics, Ltd. (United States)
Polytec, Inc. (United States)
American Elements (United States)

Cooperating Organizations
Jet Propulsion Laboratory (United States)
Colorado Photonics Industry Association (United States)

Published by SPIE

**Volume 10597** 

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 *Nano-, Bio-, Info-Tech Sensors, and 3D Systems II*, edited by Vijay K. Varadan, Proceedings of SPIE Vol. 10597 (SPIE, Bellingham, WA, 2018) Seven-digit Article CID Number.

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510616905

ISBN: 9781510616912 (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.orc

Copyright © 2018, 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. 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/18/\$18.00.

Printed in the United States of America Vm7 i ffUb 5 ggc WJUhY gž & Wži bXYf`]WY bgY Zfca 'GD-9.

Publication of record for individual papers is online in the SPIE Digital Library.



**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

∨ii ix	Authors Conference Committee
	WEARABLE AND IMPLANTABLE TECHNOLOGY AND HEALTHCARE II
10597 04	New flexible RFID antennas using natural material [10597-2]
10597 07	Design of an accelerometer to maximize the performance of vector hydrophones [10597-5]
	NANOSENSORS AND SYSTEMS I
10597 OC	DNT detection using microspheres coated with NaYF <sub>4</sub> -Yb <sup>3+</sup> ,Er <sup>3+</sup> -nanocrystals functionalized with PAA/PAH layers [10597-10]
	FABRICATION AND CHARACTERIZATION OF NANOSENSORS AND STRUCTURES I
10597 OE	Microwave characterization of graphene using an improved on-wafer calibration method [10597-12]
10597 0G	Fabrication and characteristics of cellulose nanofiber films [10597-14]
10597 OH	Fabrication and characterization of cellulose nanofiber/graphene oxide blended fibers [10597-15]
	KEYNOTE SESSION I
10597 OJ	Military comparison of 3D printed vs commercial components (Keynote Paper) [10597-17]
	3D PRINTING AND APPLICATIONS II
10597 OK	Development of multi-material 3D printer [10597-18]
10597 OL	Development of double network gel ring and evaluation of friction properties [10597-19]

10597 OM	Development of high-strength gel dosimeter made by 3D gel printer [10597-20]
10597 ON	Investigating compression strengths of 3D printed polymeric infill specimens of various geometries [10597-21]
	KEYNOTE SESSION II
10597 OP	Cellulose nanocrystal based transparent electroactive polyurethane for active lens application (Keynote Paper) [10597-23]
	NANOSENSORS AND SYSTEMS II
10597 0Q	Properties of micro-nanofibrillated-chitin/bamboo-nanofiber nanocomposite [10597-24]
10597 OR	Young's moduli of cellulose nanofibers measured by atomic force microscopy [10597-25]
10597 OS	Alignment of cellulose nanofibers by high-DC magnetic field [10597-26]
	WEARABLE MEDICAL DEVICES AND 3D PRINTING II
10597 16	RepRap SWIM-ER: low cost open-source 3D gel printer [10597-45]
10597 17	3D printing for gel robotics [10597-46]
10597 18	<b>3D printing of foods</b> [10597-47]
10597 19	Smart material for printing: piezo-electric polymer film [10597-48]
10597 1A	Fabrication of a 3D nano-printing device [10597-49]
	POSTER SESSION
10597 1B	Stealth coating is not antidote against of microwave radiometer [10597-40]
10597 1C	Yeast concentration analysis by using the portable microscope based on the fiber-optic array [10597-41]
10597 1D	Hand gesture recognition using sparse autoencoder-based deep neural network based on electromyography measurements [10597-42]

- Soft capacitive sensors for measurement of both positive and negative pressures [10597-43]
- 10597 1F Atomistic molecular dynamics study to investigate thermal response of cellulose nanofibrils using GROMACS [10597-44]