PROCEEDINGS OF SPIE

SPIDigitalLibrary.org/conference-proceedings-of-spie

Front Matter: Volume 10247

, "Front Matter: Volume 10247," Proc. SPIE 10247, Bio-MEMS and Medical Microdevices III, 1024701 (30 June 2017); doi: 10.1117/12.2282025

SPIE.

Event: SPIE Microtechnologies, 2017, Barcelona, Spain

PROCEEDINGS OF SPIE

Bio-MEMS and Medical Microdevices III

**Sander van den Driesche
Ioanna Giouroudi
Manuel Delgado-Restituto**
Editors

**9–10 May 2017
Barcelona, Spain**

Sponsored by
SPIE

Cooperating Organisation
European Optical Society

Published by
SPIE

Volume 10247

Proceedings of SPIE 0277-786X, V. 10247

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

Bio-MEMS and Medical Microdevices III, edited by Sander van den Driesche,
Ioanna Giouroudi, Manuel Delgado-Restituto, Proc. of SPIE Vol. 10247, 1024701
© 2017 SPIE · CCC code: 0277-786X/17/\$18 · doi: 10.1117/12.2282025

Proc. of SPIE Vol. 10247 1024701-1

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 *Bio-MEMS and Medical Microdevices III*, edited by Sander van den Driesche, Ioanna Giouroudi, Manuel Delgado-Restituto, Proceedings of SPIE Vol. 10247 (SPIE, Bellingham, WA, 2017) Seven-digit Article CID Number.

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510609952

ISBN: 9781510609969 (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 © 2017, 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/17/\$18.00.

Printed in the United States of America.

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

SPIE. DIGITAL LIBRARY
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	<i>Authors</i>
vii	<i>Conference Committee</i>
ix	<i>Introduction</i>

SESSION 1 BIOMEDICAL SENSORS AND MICROFLUIDICS I

10247 02	Multilayered tissues model for wave propagation loss assessment in cochlear implants [10247-1]
10247 03	Integration of a capacitive pressure sensing system into the outer catheter wall for coronary artery FFR measurements [10247-2]
10247 05	Microfluidic platform for detection and quantification of magnetic markers [10247-4]

SESSION 2 BIOMEDICAL SENSORS AND MICROFLUIDICS II

10247 06	Easy-to-use microfluidic chip for long-term 3D-cell cultures [10247-5]
10247 07	Inkjet-printed selective microfluidic biosensor using CNTs functionalized by cytochrome P450 enzyme [10247-6]
10247 09	Real-time phase correlation based integrated system for seizure detection [10247-8]
10247 0A	Bio-optical sensor for brain activity measurement based on whispering gallery modes [10247-9]

SESSION 3 BIOMEDICAL SENSORS AND MICROFLUIDICS III

10247 0B	Dark field imaging system for size characterization of magnetic micromarkers [10247-10]
10247 0C	Infrared spectroscopy as a screening technique for colitis [10247-12]
10247 0D	Micro-resonator-based electric field sensors with long durations of sensitivity [10247-14]

POSTER SESSION

10247 0E	Microfluidic system for monitoring of cardiac (H9C2) cell proliferation [10247-11]
10247 0F	Simulation of the novel compact structure of an interferometric biosensor based on multimode interference waveguides [10247-15]

- 10247 0G **Design of an embedded sensor system for measuring laser scattering on blood cells**
[10247-16]
- 10247 0H **Travelling-wave dielectrophoresis allowing flexible microchannel design for suspended cell handling** [10247-17]

Authors

Numbers in the index correspond to the last two digits of the seven-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first five digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

Ali, Amir R., 0A, 0D
Brzozka, Z., 0E
Bunge, Frank, 06, 0H
Cardoso, Susana, 05
Chudy, M., 0E
Cwik, P., 0E
Dehollain, Catherine, 02
Delgado-Restituto, Manuel, 09
Dudia, Alma, 0F
Dybko, A., 0E
Gao, Feng, 03
Ghimire, Hemendra, 0C
Giouroudi, Ioanna, 05, 0B
Gomes Martins, David, 03
Haiden, C., 0B
Hochleitner, Johannes, 07
Iosifidis, C., 0G
Jastrzebska, E., 0E
Kärkkäinen, Anu, 03
Katsaliaki, K., 0G
Keplinger, F., 0B
Kizioglou, M. E., 0G
Kobuszevska, A., 0E
Kokkinis, Georgios, 05, 0B
Kollensperger, P., 0G
Kotitschke, Marcus, 0H
Krivec, Matic, 07
Kuisma, Heikki, 03
Leitner, Raimund, 07
Leñero-Bardallo, Juan A., 09
Malec, A., 0B
Marrinan, Brendan, 03
Massoud, Yasmin M., 0A
Merlin, Didier, 0C
Paun, Maria-Alexandra, 02
Perera, A. G. Unil, 0C
Pintal, Sebastian, 03
Renaud, P., 0E
Rodríguez-Vázquez, Ángel, 09
Romaine, James B., 09
Saarilahti, Jaakko, 03
Stam, Frank, 03
Tepner, Sebastian, 0H
Titus, Jitto, 0C
Überall, Florian, 07
van den Driesche, Sander, 06, 0H
Vellekoop, Michael J., 06, 0H
Viennois, Emilie, 0C
Xhoxhi, Moisi, 0F
Ymeti, Aurel, 0F

Conference Committees

Symposium Chair

Ulrich Schmid, Technische Universität Wien (Austria)

Symposium Co-chairs

Jacopo Iannacci, Fondazione Bruno Kessler (Italy)

José Luis Sánchez-Rojas Aldavero, Universidad de Castilla-La Mancha (Spain)

Symposium Local Co-chair

Charles Cané, Centro Nacional de Microelectronica (Spain)

Conference Chair

Sander van den Driesche, Universität Bremen (Germany)

Conference Co-chairs

Ioanna Giouroudi, Technische Universität Wien (Austria)

Manuel Delgado-Restituto, Instituto de Microelectrónica de Sevilla (Spain)

Executive Organising Committee

Rainer Adelung, Christian-Albrechts-Universität zu Kiel (Germany)

Manuel Delgado-Restituto, Instituto de Microelectrónica de Sevilla (Spain)

Jean-Marc Fédéli, CEA-LETI (France)

Luis Fonseca, Centro Nacional de Microelectrónica (Spain)

Ioanna Giouroudi, DWI an der RWTH Aachen e.V. (Austria)

Erwin Peiner, Technische Universität Braunschweig (Germany)

Mika Prunnila, VTT Technical Research Centre of Finland Ltd. (Finland)

Andrei Sarua, University of Bristol (United Kingdom)

Ion M. Tiginyanu, Academy of Sciences of Moldova (Moldova)

Sander van den Driesche, Universität Bremen (Germany)

Laurent Vivien, Institut d'Électronique Fondamentale (France)

Conference Programme Committee

Artur Dybko, Warsaw University of Technology (Poland)

Michael Kraft, Université de Liège (Belgium)

Laura Maria Lechuga, Centro d'Investigacions en Nanociència i Nanotecnologia (Spain)
Konstantinos Misiakos, National Centre for Scientific Research Demokritos (Greece)
Niclas Roxhed, Royal Institute of Technology (Sweden)
Ramón Ruiz-Merino, Universitat Politècnica de Cartagena (Spain)
Josep Samitier Martí, Universidad de Barcelona (Spain)
Uwe Schnakenberg, RWTH Aachen (Germany)
Winnie E. Svendsen, Technical University of Denmark (Denmark)
Angeliki Tserepi, National Centre for Scientific Research Demokritos (Greece)
Thomas Velfen, Fraunhofer-Institut für Biomedizinische Technik (Germany)
Sabeth Verpoorte, Universiteit of Groningen (Netherlands)
Fernando Vidal-Verdú, Universidad de Málaga (Spain)
Jean-Louis Viovy, Institut Curie (France)

Session Chairs

- 1 Biomedical Sensors and Microfluidics I
Sander van den Driesche, Universität Bremen (Germany)
- 2 Biomedical Sensors and Microfluidics II
Georgios Kokkinis, Technische Universiteit Wien (Austria)
- 3 Biomedical Sensors and Microfluidics III
Manuel Delgado-Restituto, Instituto de Microelectrónica de Sevilla (Spain)

Introduction

8–9 May 2017 the Bio-MEMS and Medical Microdevices III conference took place in Barcelona, Spain. This conference was part of the SPIE Microtechnologies 2017 symposium.

Fifteen contributions, including a plenary session, were divided over three oral sessions and a poster session.

There were two main trends visible during this year's conference: Label-free bio-sensing, and biomicrofluidic systems.

Label-free bio-sensing techniques and methods to investigate biological cells and analytes were presented. In most of the contributions, light (ranging from the visible spectrum up to the mid-infrared wavelength region) was used as main source for medical analysis.

Contributions concerning biomicrofluidic systems were also strongly present at this conference. The potential of 3D cell culturing, impedance spectroscopy of cardiac cells, and magnetic markers, amongst others, were addressed.

Technological aspects of seizure detection, cochlear implants, and smart catheters were further topics also addressed during the conference.

Plenary speaker Jose A. Garrido, Institut Català de Nanociència i Nanotecnologia (ICN2) (Spain), gave an overview of graphene technologies for bioelectronics and neuroprosthetics.

On the following pages, you will find the full papers of the authors who presented their work at the conference.

I would like to thank all contributing authors for making this conference a success. Also, I would like to thank the co-chairs Ioanna Gioroudi, Technische Universität Wien, (Austria), and Manuel Delgado-Restituto, Instituto de Microelectrónica de Sevilla, (Spain) and session chair Georgios Kokkinis, Technische Universität Wien (Austria), for their assistance and for hosting sessions. Special thanks go to the symposium chair Ulrich Schmid, Technische Universität Wien, (Austria), the symposium co-chairs Jacopo Iannacci, Fondazione Bruno Kessler, (Italy) and José Luis-Sánchez-Rojas Aldavero, Universidad de Castilla-La Manch (Spain), the local co-chair Carles Cané, Ctr. Nacional de Microelectronica, (Spain), and the SPIE staff. Finally, I would like to thank the programme committee for advertising the Bio-MEMS and Medical Microdevices III conference, and for reviewing the abstracts.

Sander van den Driesche