## Microfluidics, BioMEMS, and Medical Microsystems XVI

Bonnie L. Gray Holger Becker Editors

27–29 January 2018 San Francisco, California, United States

Sponsored by SPIE

Cosponsored by microfluidic ChipShop (Germany)
The Ohio Center for Microfluidic Innovation (OCMI) at the University of Cincinnati (United States)

Published by SPIE

Volume 10491

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 *Microfluidics, BioMEMS, and Medical Microsystems XVI*, edited by Bonnie L. Gray, Holger Becker, Proceedings of SPIE Vol. 10491 (SPIE, Bellingham, WA, 2018) Sevendigit Article CID Number.

ISSN: 1605-7422

ISSN: 2410-9045 (electronic)

ISBN: 9781510614673

ISBN: 9781510614680 (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 © 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 1605-7422/18/\$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

vii	Authors
ix	Conference Committee
SESSION 1	MICROFLUDICS DEVICES I
10491 02	Silicon microneedle array for minimally invasive human health monitoring (Invited Paper) [10491-1]
10491 03	Identification of hydrodynamic forces around 3D surrogates using particle image velocimetry in a microfluidic channel [10491-2]
10491 04	Photoactuation: novel MEMS-based constructs and applications of azobenzene [10491-3]
10491 05	Modeling fluid transport in 2D paper networks [10491-4]
SESSION 2	MANUFACTURING I
10491 09	Automated assembly of microfluidic "lab-on-a-disc" [10491-8]
10491 0A	Additive manufacturing of microfluidic glass chips [10491-9]
SESSION 3	APPLICATIONS I
10491 0C	1 million-Q optomechanical microdisk resonators for sensing with very large scale integration [10491-11]
10491 0D	A microfluidic array for high-content screening at whole-organism resolution (Best Student Paper Award) [10491-12]
10491 OF	Progress on CD-DVD laser microfabrication method to develop cell culture scaffolds integrating biomimetic characteristics [10491-14]
SESSION 4	MANUFACTURING II
10491 0G	Microfluidic control of droplet formation from stable emulsions formed by aqueous two- phase systems (Invited Paper) [10491-15]
10491 OH	Structuring unbreakable hydrophobic barriers in paper [10491-16]

10491 01	Suspended liquid subtractive lithography: printing three dimensional channels directly into uncured PDMS [10491-18]
SESSION 5	APPLICATIONS II
10491 OM	Towards ultrasound enhanced mid-IR spectroscopy for sensing bacteria in aqueous solutions [10491-22]
10491 ON	Micro-engineering a platform to reconstruct physiology and functionality of the human brain microvasculature in vitro [10491-23]
SESSION 6	MICROFLUIDIC DEVICES II
10491 OP	Toward microscale flow control using non-uniform electro-osmotic flow (Invited Paper) [10491-24]
10491 OR	LED based opto-wetting platforms for micro mixing [10491-26]
10491 OS	Q-factor control of multilayer micromembrane using PZT composite material [10491-27]
SESSION 7	MEDICAL MICROSYSTEMS
10491 0V	Design of point-of-care (POC) microfluidic medical diagnostic devices [10491-30]
10491 0W	Thermally assisted acoustofluidic separation of extracellular vesicles from cells [10491-31]
10491 0X	Effective label-free biosensing system for food allergy diagnostics: comparative detection of standard Ige with ImmunoCAP [10491-32]
10491 0Y	Behavior of HepG2 liver cancer cells using microfluidic-microscopy: a preliminary study [10491-33]
SESSION 8	OPTOFLUIDICS I
10491 10	Cell-based quantification of biomarkers from an ultra-fast microfluidic immunofluorescent staining: application to breast cancer cell lines [10491-35]
10491 12	On-chip photonic particle sensor [10491-37]
SESSION 10	MEDICAL MICROSYSTEMS II
10491 16	Breath analysis based on micropreconcentrator for early cancer diagnosis (Invited Paper) [10491-41]

Pathology in a tube step 2: simple rapid fabrication of curved circular cross section millifluidic channels for biopsy preparation/3D imaging towards pancreatic cancer detection and diagnosis [10491-43]

## POSTER SESSION

10491 1A Optical coherence tomography characterization of femtosecond laser manufactured microfluidic circuits [10491-46]