

Microfluidics, BioMEMS, and Medical Microsystems XVII

Bonnie L. Gray

Holger Becker

Editors

2–4 February 2019

San Francisco, California, United States

Sponsored by

SPIE

Cosponsored by

Microfluidic ChipShop GmbH (Germany)

The Ohio Center for Microfluidic Innovation (OCMI) at The University of Cincinnati (United States)

Published by

SPIE

Volume 10875

Proceedings of SPIE, 1605-7422, V. 10875

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 *Microfluidics, BioMEMS, and Medical Microsystems XVII*, edited by Bonnie L. Gray, Holger Becker, Proceedings of SPIE Vol. 10875 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

ISSN: 1605-7422
ISSN: 2410-9045 (electronic)

ISBN: 9781510623927
ISBN: 9781510623934 (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. 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 1605-7422/19/\$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

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	<i>Authors</i>
ix	<i>Conference Committee</i>

MANUFACTURING I

10875 03	High-throughput thermal replication of transparent fused silica glass [10875-2]
10875 04	Pure proteinaceous high-aspect-ratio microstructures made by femtosecond laser multiphoton cross-linking (Applications of 3D Printing Best Paper Award) [10875-3]
10875 05	Structuring unbreakable and autoclavable hydrophobic barriers in paper via direct printing and mask-based photolithography [10875-4]
10875 06	LIDE: high aspect ratio glass processing technology for the mass production of microfluidic devices for biomedical applications [10875-5]

MANUFACTURING II

10875 07	Multifunctional microfluidic devices from tailored photopolymer formulations (Invited Paper) [10875-6]
10875 08	Suspended liquid subtractive lithography: printing three dimensional channels directly into uncured polymeric matrices [10875-7]
10875 0A	3D printing of highly fluorinated methacrylates for the rapid prototyping of transparent and chemically resistant microfluidic devices [10875-9]

MICROFLUIDIC DEVICES I

10875 0C	Automated laser-assisted synthesis of microarrays for infectious disease research (Invited Paper) [10875-11]
10875 0D	Microfluidic mixing and jetting devices based on SU8 and glass for time-resolved molecular imaging experiments [10875-12]
10875 0E	Confocal Raman thermometer for microfluidic devices [10875-13]
10875 0F	Holographic imaging for tracking and phase retrieval in acoustophoresis platforms [10875-14]

10875 OG **Electrohydrodynamic cell concentration for biofabrication of agar-based 3D microtissues**
[10875-15]

MICROFLUIDIC DEVICES II

10875 OJ **Dual dielectrophoresis controller and fluorescence analysis platform for capillary-driven microfluidics on a portable device** [10875-18]

10875 OK **Exact solution for laser-induced thermo-capillary force on a 3D microbubble in a liquid**
[10875-19]

10875 OL **An adaptive mesh refinement based simulation for pressure-deformability analysis of a circulating tumor cell** [10875-20]

MANUFACTURING III

10875 OO **Zinc-oxide nanowires growth in-situ in microfluidic chamber** [10875-23]

10875 OP **Laser direct-writing to enable filtration in paper-based devices (Best Student Paper Award)**
[10875-24]

10875 OQ **Development of a robotic 3D bioprinting and microfluidic pumping system for tissue and organ engineering** [10875-25]

MEDICAL DEVICES I

10875 OR **Integrated microfluidic probes for cell manipulation and analysis (Invited Paper)** [10875-26]

10875 OS **Merging micro and nano: study of transport of gold nanoparticles inside a tumor microenvironment-on-a-chip** [10875-27]

10875 OU **3D imaging in microfluidics: new holographic methods and devices** [10875-29]

OPTOFLUIDICS I

10875 OV **Breaking the trade-off between sensitivity and Q-factor for high-Q slot mode photonic crystal nanobeam cavity biosensors with optomechanical feedback** [10875-30]

10875 OW **Design and analysis of optical ring resonator for bio-sensing application** [10875-31]

MEDICAL DEVICES II

- 10875 10 **Microfluidics for health monitoring applications (Invited Paper)** [10875-35]
- 10875 11 **Microring resonator biosensing platform for sensitive detection of thrombin** [10875-36]

OPTOFLUIDICS II

- 10875 16 **Optical fiber based light scattering detection in microfluidic droplets** [10875-41]
- 10875 17 **High throughput optical analysis and sorting of cells and particles in microfluidic systems** [10875-42]

APPLICATIONS

- 10875 18 **Studying the roundworm *Caenorhabditis elegans* using microfluidic chips (Invited Paper)** [10875-43]
- 10875 1C **A 3D printed centrifugal microfluidic platform for solid-phase-extraction and fluorescent detection of spilled oil in water** [10875-47]

POSTER SESSION

- 10875 1F **Immuno-capture of cells in open microfluidics: microfluidic probes integrated with herringbone micro-mixers** [10875-50]
- 10875 1G **3D printed micro-electro-fluidic probe (MeFP) for single cell electroporation** [10875-51]