

---

# Contents

<i>Preface</i> . . . . .	<i>v</i>
<i>Contributors</i> . . . . .	<i>xi</i>

## SECTION I MICROFLUIDIC DIAGNOSTICS: FROM THE CLASSROOM TO THE BOARDROOM

1 Present Technology and Future Trends in Point-of-Care Microfluidic Diagnostics . . . . .	3
<i>Lawrence Kulinsky, Zahra Noroozi, and Marc Madou</i>	
2 Teaching Microfluidic Diagnostics Using Jell-O® Chips . . . . .	25
<i>Cheng Wei T. Yang and Eric T. Lagally</i>	
3 Fundamentals of Microfluidics for High School Students with No Prior Knowledge of Fluid Mechanics . . . . .	41
<i>Vishal Tandon and Walter Peck</i>	
4 Measuring Microchannel Electroosmotic Mobility and Zeta Potential by the Current Monitoring Method . . . . .	55
<i>Chenren Shao and Don L. DeVoe</i>	
5 Overview of the Microfluidic Diagnostics Commercial Landscape . . . . .	65
<i>Lily Kim</i>	
6 Practical Aspects of the Preparation and Filing of Patent Applications . . . . .	85
<i>Fiona Bessoth</i>	
7 Introduction to In Vitro Diagnostic Device Regulatory Requirements . . . . .	103
<i>Jonathan Day</i>	

## SECTION II MICROFLUIDIC DIAGNOSTICS: FABRICATION AND MANIPULATION PROTOCOLS

8 Microfluidic Device Fabrication by Thermoplastic Hot-Embossing . . . . .	115
<i>Shuang Yang and Don L. DeVoe</i>	
9 Introduction to Glass Microstructuring Techniques . . . . .	125
<i>Radoslaw Mazurczyk and Colin D. Mansfield</i>	
10 Glass Microstructure Capping and Bonding Techniques . . . . .	141
<i>Radoslaw Mazurczyk, Colin D. Mansfield, and Marcin Lygan</i>	
11 Rapid Prototyping of PDMS Devices Using SU-8 Lithography . . . . .	153
<i>Gareth Jenkins</i>	
12 Microfluidic Interface Technology Based on Stereolithography for Glass-Based Lab-on-a-Chips . . . . .	169
<i>Song-I Han and Ki-Ho Han</i>	
13 Three-Dimensional, Paper-Based Microfluidic Devices Containing Internal Timers for Running Time-Based Diagnostic Assays . . . . .	185
<i>Scott T. Phillips and Nicole K. Thom</i>	

14	Thread Based Devices for Low-Cost Diagnostics . . . . .	197
	<i>Meital Reches</i>	
15	Droplet-Based Microfluidics . . . . .	207
	<i>Sanjiv Sharma, Monpichar Srisa-Art, Steven Scott, Amit Asthana, and Anthony Cass</i>	
16	Droplet-Based Microfluidics for Binding Assays and Kinetics Based on FRET . . . . .	231
	<i>Monpichar Srisa-Art and Sanjiv Sharma</i>	
17	Surface Treatments for Microfluidic Biocompatibility . . . . .	241
	<i>N.J. Shirtcliffe, R. Toon, and P. Roach</i>	
18	Superhydrophobicity for Antifouling Microfluidic Surfaces . . . . .	269
	<i>N.J. Shirtcliffe and P. Roach</i>	

### SECTION III MICROFLUIDIC DIAGNOSTICS: APPLICATION PROTOCOLS

19	The Application of Microfluidic Devices for Viral Diagnosis in Developing Countries . . . . .	285
	<i>Samantha M. Hattersley, John Greenman, and Stephen J. Haswell</i>	
20	Applications of Microfluidics for Molecular Diagnostics . . . . .	305
	<i>Harikrishnan Jayamohan, Himanshu J. Sant, and Bruce K. Gale</i>	
21	Quantitative Heterogeneous Immunoassays in Protein Modified Polydimethylsiloxane Microfluidic Channels for Rapid Detection of Disease Biomarkers . . . . .	335
	<i>Peng Li</i>	
22	Breast Cancer Diagnostics Using Microfluidic Multiplexed Immunohistochemistry . . . . .	349
	<i>Minseok S. Kim, Seyong Kwon, and Je-Kyun Park</i>	
23	Charged-Coupled Device (CCD) Detectors for Lab-on-a Chip (LOC) Optical Analysis . . . . .	365
	<i>Avraham Rasooly, Yordan Kostov, and Hugh A. Bruck</i>	
24	Multilayer Microfluidic Poly(Ethylene Glycol) Diacrylate Hydrogels . . . . .	387
	<i>Michael P. Cuchiara and Jennifer L. West</i>	
25	Purification of DNA/RNA in a Microfluidic Device . . . . .	403
	<i>Andy Fan, Samantha Byrnes, and Catherine Klapperich</i>	
26	Agarose Droplet Microfluidics for Highly Parallel and Efficient Single Molecule Emulsion PCR . . . . .	413
	<i>Xuefei Leng and Chaoyong James Yang</i>	
27	Integrated Fluidic Circuits (IFCs) for Digital PCR . . . . .	423
	<i>Ramesh Ramakrishnan, Jian Qin, Robert C. Jones, and L. Suzanne Weaver</i>	
28	microFIND® Approach to Fluorescent in Situ Hybridization (FISH) . . . . .	433
	<i>Andrea Zanardi, Emanuele Barborini, and Roberta Carbone</i>	
29	An ELISA Lab-on-a-Chip (ELISA-LOC) . . . . .	451
	<i>Avraham Rasooly, Hugh A. Bruck, and Yordan Kostov</i>	
30	Multiplexed Surface Plasmon Resonance Imaging for Protein Biomarker Analysis . . . . .	473
	<i>Eric Ouellet, Louise Lund, and Eric T. Lagally</i>	

31	Surface Acoustic Wave (SAW) Biosensors: Coupling of Sensing Layers and Measurement . . . . .	491
	<i>Kerstin Länge, Friederike J. Grubl, and Michael Rapp</i>	
32	Microchip UV Absorbance Detection Applied to Isoelectric Focusing of Proteins . . . . .	507
	<i>Junjie Ou and Carolyn L. Ren</i>	
	<i>Index</i> . . . . .	523

Microfluidic Diagnostics

Methods and Protocols

Jenkins, G.; Mansfield, C.D. (Eds.)

2013, XIII, 525 p., Hardcover

ISBN: 978-1-62703-133-2

A product of Humana Press