Preface to Special Topic: Selected Papers from the 5th International Conference on Optofluidics
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Citation: Biomicrofluidics 10, 011701 (2016); doi: 10.1063/1.4942611
View online: http://dx.doi.org/10.1063/1.4942611
View Table of Contents: http://scitation.aip.org/content/aip/journal/bmf/10/1?ver=pdfcov
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Preface to Special Topic: Selected Papers from the 5th International Conference on Optofluidics

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(Received 10 February 2016; accepted 11 February 2016; published online 29 February 2016)

The 5th International Conference on Optofluidics (Optofluidics 2015) was held in Taipei, Taiwan, July 26–29, 2015. The aim of this conference was to provide a forum to promote scientific exchange and to foster closer networks and collaborative ties between leading international researchers in optics and micro/nanofluidics across various disciplines. The scope of Optofluidics 2015 was deliberately broad and interdisciplinary, encompassing the latest advances and the most innovative developments in micro/nanoscale science and technology. Topics ranged from fundamental research to its applications in chemistry, physics, biology, materials, and medicine. © 2016 AIP Publishing LLC.

Approximately 300 delegates participated in Optofluidics 2015 from across the globe, including Australia, Canada, China, France, Germany, Hong Kong, India, Japan, Korea, Singapore, Taiwan, UK, and USA. In total, 242 presentations were arranged, including 10 plenary speeches, 27 keynote speeches, 65 invited talks, 33 contributed talks, and 107 poster presentations. This collection of twelve papers on this special topic spans both the fundamentals and the frontier applications of this interdisciplinary research field.

Optical measurements of particle or flow and fluidic manipulation for optical applications were presented. Lin and Su¹ reported a novel method to measure the depth position of rapidly moving objects inside a microfluidic channel based on the chromatic aberration effect; the depth positions of label-free particles of diameter as small as 2 μm and erythrocytes of concentration 2 × 10⁵ cells/μL and velocity 2.78 mm/s were detected within a range ±25 μm in a simple and inexpensive manner. Sun and Huang² demonstrated the use of a microscopic circular polariscope to measure the flow-induced birefringence in a microfluidic device that represents the kinematics of fluid motion optically; CTAB:NaSal, CPyCl:NaSal, and CPyCl:NaSal:NaCl solutions were used to investigate the strain rate and the results were compared with the μPIV diagnosis. He et al.³ studied the fundamentals, especially the thinning and opening of the oil film within each pixel of an electrowetting display; to achieve repeatable oil movement and the resulting pixel performance, a new method to fill each pixel with a controllable oil volume using an oil-droplet emulsion created with a microfluidic device was demonstrated.

This special topic includes papers also on particle manipulation. Weng et al.⁴ evaluated the size-dependent crossing frequency of dielectrophoretically driven particles; numerical simulation using a Maxwell stress tensor and a finite element method was reported to assess the size effect. In addition to electric manipulation, magnetic driving of the particles was demonstrated. Ido et al.⁵ examined microswimmers of magnetic particle chains in an oscillating magnetic field experimentally and analyzed numerically with a lattice Boltzmann method, an immersed boundary method, and a discrete particle method based on simplified Stokesian dynamics. Huang et al.⁶ described a technique to manipulate magnetic beads and achieved a great washing efficiency with zero bead loss using an appropriate electrode design and channel height of a digital microfluidic immunoassay; a model immunoassay of human soluble tumor necrosis factor

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receptor I (sTNF-RI) was performed to offer an improved limit of detection (3.14 pg/ml) with a small number of magnetic beads (25 beads), decreased reagent volumes (200 nl), and decreased duration of analysis (<1 h). Chiu et al.\textsuperscript{7} reported particle separation using cross-flow filtration enhanced with hydrodynamic focusing; label-free separation of particles of diameters 2.7 and 10.6 \( \mu \text{m} \) at a sample throughput 10 \( \mu \text{L}/\text{min} \) was performed; separation of spiked human prostate cancer cell lines (PC3) cells in whole blood was also demonstrated.

Chemical sensors and biosensors are covered in this special topic. Cheng et al.\textsuperscript{8} measured the chemical compounds in third-hand smoke on varied clothing fibres with an analytical balance, or nicotine and 3-ethenylpyridine (3-EP) with a surface-acoustic-wave sensor composed of coated oxidized hollow mesoporous carbon nanospheres. Pu et al.\textsuperscript{9} described a continuous glucose monitoring microsystem consisting of a three-electrode electrochemical sensor in which the working electrode (WE) was covered with a single layer of graphene and gold nanoparticles to improve the sensor performance; the results of glucose measurement were linear below concentration 162 mg/dl with a detection limit 1.44 mg/dl. Li et al.\textsuperscript{10} implemented a microfluidic device measuring the glucose concentration with integrated fibre-optic surface plasmon resonance sensor and electrode pairs for volume quantification.

Implantable devices and microneedles for drug delivery and liquid transport are addressed in this special topic. Zhang et al.\textsuperscript{11} reported a flexible polyimide device seated under rabbit eyelids to deliver drug by iontophoresis; varied currents to release manganese ions (Mn\(^{2+}\)) as tracers were investigated; the thermal effect on application of a current was studied. Lee et al.\textsuperscript{12} presented a disposable Parylene microneedle array of large aspect ratio that vibrated with a piezoelectric actuator to mimic the vibrating motion of a mosquito’s proboscis and to decrease the insertion force by 40%. Song et al.\textsuperscript{13} demonstrated microinjection into a model organism, Caenorhabditis elegans (C. elegans) on an automated device capable of loading, immobilization, injection, and sorting; with 200 worms studied, injection speed 6.6 worm/min, injection success rate 77.5%, and sorting success rate 100% were obtained.

We express our gratitude for the financial support from Ministry of Science and Technology (Taiwan), Bureau of Foreign Trade (Taiwan), National Taiwan University and Research Center for Applied Sciences of Academia Sinica, and for administrative support from Instrument Technology Research Center in making Optofluidics 2015 a successful conference. Our acknowledgements include Leslie Yeo, Frederick Kontur, Christine Urso, and all staff from Biomicrofluidics for their kind assistance during the preparation, and, most importantly, all authors who have contributed their work for this special topic.

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