MicroTAS 2021 Workshop 9 Information

WORKSHOP TITLE: Microfluidic Systems Integration

PRESENTER AFFILIATION:
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WORKSHOP DESCRIPTION:
Microfluidics, also called “micro Total Analysis System (mTAS)” or “Lab on a Chip (LoC)”, allow the integration of various stages of the analytical processes on a single chip. By integrating with sample pretreatment, manipulation, analysis and detection modules, the microfluidic system can be applied in various fields such as high-throughput drug screening and point-of-care disease diagnostics. However, the realization of fully integrated microfluidic systems for bioanalysis, with sufficiently high sensitivity and specificity and low operational complexity remains an elusive goal, despite the intensive efforts in the past decades.

This workshop will give a general overview on the current integrated microfluidic systems developed for bioanalyses and discuss the possible solutions such as digital, multiphase, optofluidic techniques to implement a sample-to-answer microfluidic system for directing the future development of these systems. Particularly, three main integrated microfluidic systems will be discussed: 1-paper microfluidics, 2- microfluidics for nucleic acid analysis, and 3- Open instrument and device for single cell study. The abovementioned microfluidic devices are generally integrated with sample pretreatment, manipulation and analysis modules, and with the potential of sample-to-answer capabilities. The attendees will be introduced to design and fabrication of the integrated microfluidic systems, different strategies for fluid control, integration and specific applications related to biosensing and bioanalysis will also be discussed in-depth.

OVERVIEW OF MATERIAL TO BE COVERED AND WHAT ATTENDEES CAN EXPECT TO TAKE AWAY FROM THE WORKSHOP:

This workshop part contains 3 lectures:

(i) Paper microfluidics (Prof. Chen): The first lecture will first provide an overview of paper-based analytical device concepts, functions and applications. Different sensing components, including device fabrication, surface chemistry, signal amplification and biomolecular recognition will be introduced. Moreover, the 2D and 3D paper devices and polymer/paper hybrid systems for global health and environmental monitoring in resource-limited settings will be discussed.

(ii) Microfluidics for nucleic acid analyses (Dr. Yuan): The second lecture will present an overview of microfluidic concepts with the emphasis on the applications of nucleic acid analyses. Some selected microfluidics will be introduced which are equipped with cell lysis and nucleic acid amplification modules, flow rate regulation system, temperature control system and optical components, to show the applicability of the integrated microfluidic system in nucleic acid analyses. Moreover, the challenges such as poor sensitivity and high cost of these microfluidic systems will also be discussed.

(iii) Fully-integrated field-deployable chemical sensors (Dr Nightingale): The third lecture will discuss the challenges that present themselves when integrating analytical microfluidic systems to be used “in-the-field” and at “point-of-care”. Using two case studies – chemical sensors developed for medical and environmental settings – we will discuss not only specific technical issues of designing and integrating fluidic architectures, pumps, valves, optics, chemical reagents, and electronics; but also the management and general design challenges thar present themselves when making integrated systems.

WHO SHOULD ATTEND:

The workshop is intended for a broad audience, ranging from PhD and

postdoctoral researchers of the engineering and analytical fields, to application specialists, representatives of clinical/end-user community as well as industrial stakeholders. The presentations will be held in an easy-to-comprehend language, avoiding technical terminology.

PARTICIPANTS WILL NEED THE FOLLOWING:
Laptop

For those attending in-person, a laptop or iPad with headphones are required.