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TEMASEK LIFESCIENCES LABORATORY

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The Auditorium (Level 1)

Hosted by: Dr Greg JEDD

Microfluidic platforms for biotechnology applications

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Amy Shen is a full professor who leads the Micro/Bio/Nanofluidics Unit at Okinawa Institute of Science and Technology in Japan. Her research is focused on nano/microfluidics with applications in biotechnology. She received the National Science Foundation's CAREER Award in 2007, and a Fulbright Professorship in 2013. Amy is an associate editor for Micomachines, Biomedical Microdevices, and Scientific Reports.

Microfluidics is the science of manipulating and controlling fluids, usually in volumes ranging from microliters to picoliters, in networks of channels with dimensions from tens to hundreds of micrometers. Characterizing and understanding the causes of flow instabilities and bifurcations in microfluidics is relevant to many important industrial and biological processes. In this talk, I will present research connected to two simple microfluidic platforms with applications to biotechnology:

a) Flow-induced structural formation of wormlike micellar solutions (i.e., living polymers) in a microfluidic device with constriction and expansion, or containing micropost arrays. Similar microfluidic platforms can be used to make soft nanoporous materials for biosensing applications [1.2].

b) Understanding nanoconfinement phenomena is necessary to develop nanofluidic technology platforms. We demonstrate a convection limited nanofluidic immunoassay that achieves total capture of a target analyte, and an apparent shift in the reaction equilibrium due to nanoconfinement [3].

Recent Publications:

1. J. J. Cardiel, A. C. Dohnalkova, N. Dubash, Y. Zhao, P. Cheung, **Amy Q. Shen**, Microstructure and rheology of a flow-induced structured phase in wormlike micellar solutions, *PNAS Plus*, 110 (18), E1653-E1660, 2013.
2. S. J. Haward, N. Kitajima, K. Toda-Peters, T. Takahashi, **Amy Q. Shen**, Flow of wormlike micellar solutions around microfluidic cylinders with high-aspect-ratio and low blockage ratio, *Soft Matter*, 15, 1893-2104, 2019.
3. C. Galvin, K. Shirai, A. Rahmani, K. Masaya, **Amy Q. Shen**, Total Capture, Convection Limited Nanofluidic Immunoassays Exhibiting Nanoconfinement Effects, *Analytical Chemistry*, 90, 5, 3211—3219, 2018.