

All-aqueous Droplet Engineering for Cytomimicry and Bioencapsulation

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Abstract

In many biological settings, smaller building blocks are assembled into larger functional units. In the synthetic world, liquid droplets offer dynamicity and tenability that promise routes to mimic the unique properties of natural droplets. In this talk, I will share our works in combining physico-chemical phenomena, such as phase separation, and hydrodynamic microfluidic flows to form biocompatible droplets, and use them as templates to fabricate particles and capsules. These droplet-templated structures can be made highly biocompatible, and exhibit behaviors similar to those of their biological counterparts [1,2]. I will also discuss how these droplets can encapsulate biologically relevant ingredients and reactions. Overall, I will close the talk by discussing the potential offered by the aqueous droplets in understanding the origin of life and in mimicking the cellular environments and organelles [3,4].

Keywords: Droplets; microfluidics; soft matter.

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Biography of Presenting Author



Anderson Ho Cheung Shum received his B.S.E. degree, summa cum laude, in Chemical Engineering from Princeton University, S.M. and Ph.D. in Applied Physics from Harvard University. He is currently a Professor and Associate Head in the Department of Mechanical Engineering, The University of Hong Kong. His research interests include emulsions, biomicrofluidics, biomedical engineering and soft matter. Prof. Shum received Croucher Senior Research Fellowship 2020, Rising Start Award by Ton Duc Thang University (Vietnam), NSFC Excellent Young Scientist Fund in 2019, Young Scientists Award in Microsystems and Nanoengineering Summit 2019, silver medals in the 46th and 47th International Exhibition of Inventions (Geneva, Switzerland)

in 2018 and 2019, IEEE Nanomed New Innovator 2018, the Early Career Award by the Research Grants Council of Hong Kong in 2012. He was selected to join the Global Young Academy as a new member (first from Hong Kong) in 2021, the Young Academy of Sciences of Hong Kong as a founding member in 2018 and the Royal Society of Chemistry (RSC) as a fellow in 2017. He serves as an associate editor for Biomicrofluidics (American Institute of Physics), editorial board member for Scientific Reports (Springer Nature) and an editorial advisory board member for Lab-on-a-Chip (RSC).

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