Understanding Rheology: From Stabilizing an Interface to Drug Delivery and 3D Printing

by

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Abstract

Flow is ubiquitous in many technologically relevant processes and understanding the rheology, or flow behavior, of matter is critical to achieving the desired properties for different applications. In the first part of this seminar, I will describe how particles may adsorb and assemble at an interface, thereby stabilizing emulsions and foams. We have developed an experimental technique to map out the global deformation field as a particle-laden interface is compressed. Such information is further used to quantify the mechanical robustness of an interface. In the second part of this seminar, I will present our experimental work on understanding the flow dynamics of particles in blood flow. This work is particularly relevant to designing drug-carrying particles for more targeted cancer therapy. In the last part of my seminar, I will highlight some of our most recent activities on using inkjet and 3D printing to create nanocomposites, biological models, drug tablets, and even chocolate. The successful printing of all these materials hinges on understanding the underlying rheology and transport phenomena.

Dr. Anson Ma is a tenured Associate Professor in the Department of Chemical and Biomolecular Engineering and Polymer Program at the University of Connecticut, and currently a visiting professor on sabbatical at Unilever and Yale University. Dr. Ma obtained his Ph.D. degree in Chemical Engineering from the University of Cambridge (UK) in 2009 after completing his B.Eng. (2003) and M.Phil (2005) degrees at the Hong Kong University of Science and Technology (HKUST). Dr. Ma received a number of accolades, including a Croucher Foundation Scholarship (2005), a J. Evans Attwell-Welch Fellowship from Rice University (2009), a Distinguished Young Rheologist Award from TA Instruments (2012), a US National Science Foundation (NSF) CAREER award (2013), the Arthur B. Metzner Early Career award by the Society of Rheology (2015), a 3M Non-Tenured Faculty Award (2016), and an Early Career Award from the American Association of University Professors-UConn Chapter (2017).

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