CHEMICAL AND BIOLOGICAL ENGINEERING

SEMINAR ANNOUNCEMENT

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“Towards Scalable Manufacturing of Nanocomposite Films and Membranes Using Capillarity”

SEPTEMBER 10, 2018
12:00 NOON
SciTech Room 136
“Towards Scalable Manufacturing of Nanocomposite Films and Membranes Using Capillarity”

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Abstract

In this talk, I will describe new approaches for scalable manufacturing of nanocomposites by harnessing capillary interactions between nanoparticles and fluids. In the first part of this talk, I will describe our work on generating nanocomposite films with extremely high loadings of nanoparticles using capillary rise infiltration (CaRI). In CaRI, composites are formed by thermally annealing a bilayer of polymer and nanoparticle, which induces imbibition of polymer into the interstices of the nanoparticle packing. I will share our current understanding of the transport phenomena involved in CaRI. In particular, the effect of physical confinement and nanoparticle-polymer interactions on the dynamics of polymers will be discussed. In the second part, I will describe our recent efforts in creating bicontinuous interfacially jammed emulsions (BIJELs), which are a new class of soft materials with potential applications in reactive separation, membrane separation and catalysis. We have developed a new method to enable continuous generation of bijels using solvent-transfer-induced phase separation (STRIPS). We have developed a new method to enable continuous generation of bijel microparticles, fibers and membranes using solvent-transfer-induced phase separation (STRIPS). A new in situ technique to characterize the mechanical properties of these STRIPS bijel fiber as well as the application of bijels in ultrafiltration and biphasic reactive separation will be discussed.