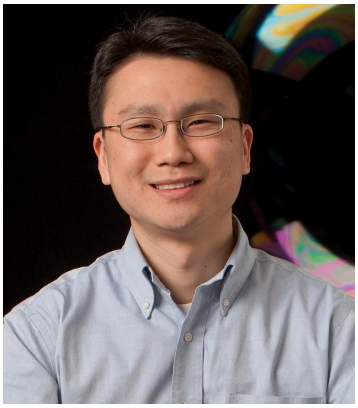
Chemical & Biomolecular Seminar Series



Daeyeon Lee

Professor

Chemical & Biomolecular Engineering

University of Pennsylvania

Friday, September 16, 2016

10:00—11:00 a.m.

102 Colburn Lab

Daeyeon Lee is Professor of Chemical and Biomolecular Engineering at the University of Pennsylvania. Daeyeon received his B.S. in Chemical Engineering from Seoul National University in 2001 and received his Ph.D. in Chemical Engineering/Program in Polymer Science and Technology at MIT in 2007 co-supervised by Robert E. Cohen and Michael F. Rubner. After his Ph.D., Daeyeon was a postdoctoral fellow in the School of Engineering and Applied Sciences at Harvard University where he worked with David A. Weitz. Daeyeon joined the Department of Chemical and Biomolecular Engineering at the University of Pennsylvania in 2009. Daeyeon has won numerous awards and recognitions including the 2010 Victor K. LaMer Award from ACS Colloid and Surface Chemistry Division, the NSF CAREER Award (2011), the 2011 Korean-American Scientists and Engineers Association Young Investigator Award, the 2012 KIChE President Young Investigator Award, the 2013 3M Nontenured Faculty Award, the 2013 AIChE NSEF Young Investigator Award and the 2014 Unilever Young Investigator Award for Outstanding Young Investigator in Colloid and Surfactant Science.

Toward Scalable Nanomanufacturing Using Capillarity

In this talk, I will describe new approaches for scalable manufacturing of nanocomposites with unique structures and properties by exploiting capillary interactions between solid particles and fluids. In the first part of this talk, I will describe our work on generating polymer nanocomposite films (PNCFs) with extremely high loadings of nanoparticles using capillary rise infiltration (CaRI). Owing to the high loadings of nanoparticles, these PNCFs have extraordinarily high hardness, modulus and scratch resistance. In CaRI, PNCFs are formed by thermally annealing a bilayer of polymer and nanoparticle, which induces imbibition of polymer into the nanoparticle layer. CaRI represents an interesting transport phenomenon in which the size of the fluid molecule (*i.e.*, polymer) is comparable to the pore size in the nanoparticle layer. I will share our current understanding of the transport processes involved in CaRI. By adjusting the amount of polymers undergoing CaRI, we can also generate three-phase nanocomposites, which may have potential applications in the areas of membrane separations and energy storage and conversion. In the second part of this presentation, 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 bijel microparticles, fibers and membranes using solvent-transfer-induced phase separation (STRIPS). Transport of molecules with opposite polarity as well as membrane separation of nanoparticles using STRIPS bijels will be demonstrated. Also, a new *in situ* technique to characterize the mechanical properties of these STRIPS bijel fiber as well as the formation of ultrafiltration membranes using STRIPS will be discussed.