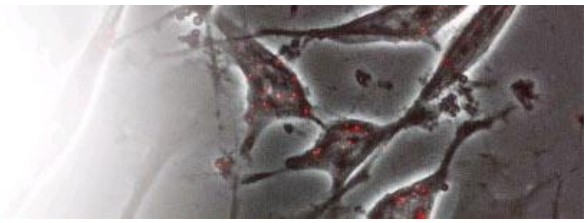
UCLA Engineering

Chemical and Biomolecular Engineering



SEMINARS IN CHEMICAL AND BIOMOLECULAR ENGINEERING

Friday, Nov. 30, 2018
10:00am-11:00am
Boelter Hall 3400

Frank S. Bates

Regents Professor
Chemical Engineering & Materials Science
University of Minnesota

"Sphericity and Symmetry Breaking in Asymmetric Diblock Copolymer Melts"

Block polymers have captured the interest of scientists and engineers for more than half a century. In general, the phase behavior of A-B diblock copolymers, the simplest category of such self-assembling macromolecules, has been accepted as thoroughly understood. Recent experiments with low molecular weight diblock copolymers have revealed remarkable phase complexity in the limit of asymmetric compositions, $0.15 < f_A < 0.25$, where f_A signifies the volume fraction of the minority block. Small-angle x-ray scattering (SAXS) measurements conducted in the vicinity of the order-disorder transition (ODT) temperature have revealed the formation of various low symmetry Frank-Kasper phases and a dodecagonal quasicrystal as a function of thermal processing history. Remarkably, when heated above the ODT temperature the liquid micelles retain a memory of the ordered state, which returns upon cooling. These finding will be discussed in the context of a competition between the tendency to form spherical micelles and the constraints associated with filing space at uniform density.

Frank S. Bates is a Regents Professor and a member of the Chemical Engineering and Materials Science department at the University of Minnesota. He received a B.S. in Mathematics from SUNY Albany and M.S. and Sc.D. degrees in Chemical Engineering from MIT. Between 1982 and 1989 Bates was a member of the technical staff at AT&T Bell Laboratories then joined the University of Minnesota where he served as department Head from 1999 to 2014. Bates conducts research on a range of topics related to polymers, with a particular focus on the thermodynamics and dynamics of block polymers, blends and solutions. He is a member of the National Academy of Engineering and the National Academy of Sciences, and the American Academy of Arts and Sciences.