Chemical Engineering

Fall 2021 Seminar Series

http://cheme.mit.edu/seminar-series/

Students Choice

Salt-induced Liquid–Liquid Phase Separation

Zhen-Gang Wang

Division of Chemistry & Chemical Engineering
California Institute of Technology

Friday, October 22, 2021
3:00pm
via Zoom (link to be sent day of seminar)

ABSTRACT: Liquid–liquid (L–L) phase separation is ubiquitous in nature and in many applications, such as in separation and extraction of chemicals and pharmaceuticals, and in consumer product formulations. Adding salts to otherwise miscible liquids can induce phase separation. In this talk I will present some simple concepts and models we have developed to understand this phenomenon. After a brief discussion of the thermodynamics for liquid miscibility and a new theory we developed to quantify the "like-dissolves-like" rule, I will talk about two examples of L–L phase separations, lithium salt-induced microphase separation in block copolymers, and salt-induced phase separation in water–acetonitrile binary mixtures. Our studies highlight the role of Born solvation energy and ion-hydration entropy as the main driving forces for salt-induced L–L phase separation.

Prof. Wang's research is the theoretical and computational study of structures, phase behavior, interfacial properties and dynamics of polymers, soft materials, and biophysical systems. His current activities revolve around three main themes: charged systems, including polyelectrolytes, salt-doped polymers, and electric double layers; nucleation or more generally barrier crossing in polymers and soft matter; and nonlinear rheology of polymer gels and entangled polymers.