

“Helping Nanoparticles and Other Soft Matter Reach Their Colloidal Potential”

**Wednesday
November 28, 2018
3:00 pm
Wu and Chen Auditorium
Levine Hall**



Keith P. Johnston
M.C. and Mary Beth Baird Endowed Chair
Department of Chemical Engineering
University of Texas at Austin

Abstract

Fundamental colloid and interface science plays a key role in protein drug delivery and in the design of novel soft matter for energy applications. For processing and subcutaneous delivery of monoclonal antibodies (~10 nm colloidal particles), it is challenging to achieve low viscosities and high stabilities at high concentrations from 100 to 300 mg/ml. Advancements in this field are being guided by a deeper understanding of protein-protein interactions and morphology with small angle X-ray scattering (SAXS) and static and dynamic light scattering. For the energy field, novel concepts are presented to stabilize soft matter including nanoparticles, nanocapsules, emulsions, and foams with strategically designed ligands, surfactants, polymers and polyelectrolytes. Here, challenging conditions of composition, high salinities and temperatures are often encountered. Ultra-dry foams may be stabilized with viscoelastic aqueous phases, and completely nonaqueous gas/oil foams may be stabilized with comb polymers, despite very low interfacial tensions. These soft matter concepts may be used to guide advancement in subsurface applications with enormous implications for global energy development and environmental impact, including CO₂ sequestration/enhanced oil recovery, nanocapsules for controlled release, and green waterless fracture fluids for the next couple of decades, until fully green alternative energy becomes ubiquitous.

Bio

Keith Johnston received his Ph.D. in 1981 in Chemical Engineering at the University of Illinois (with Chuck Eckert) and joined UT after a year at Sandia National Laboratories. His awards include the Allan P. Colburn Award, an award for Excellence in Industrial Gases Technology from AIChE, and he was named by AIChE in a list of “One Hundred Chemical Engineers of the Modern Era.” He is a member of the National Academy of Engineering and a Fellow of the American Institute of Medical and Biological Engineers. He directed UT’s activities in the NSF Science and Technology Center: Environmentally Responsible Solvents and Processes through 2009. He conducts fundamental research, combining materials chemistry, colloid and interface science and polymer science to guide the development of applications in a wide range of fields, including drug delivery, biomedical imaging/therapy, electrocatalysis in energy storage, and subsurface energy production. He has discovered/co-discovered various nanomaterials, including water/CO₂ microemulsions, silicon nanowires, and highly active perovskite electrocatalysts and supercapacitors. He has made significant contributions in a new field of nanotechnology for subsurface green energy production, which includes CO₂ sequestration, improved oil recovery, magnetic nanomaterials for electromagnetic imaging of reservoirs, nanocapsule delivery and greener fracturing with low water utilization.

Fall 2018 CBE Seminar Series

