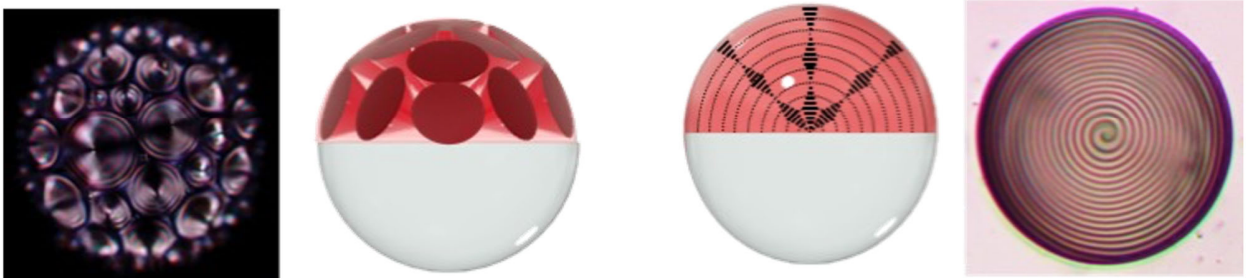
Chemistry of Dynamic Liquid-Liquid Interfaces

This lecture will focus on the design of systems wherein reconfiguration of complex liquid emulsions (droplets) and related materials can be triggered chemically, biochemically, or with magnetic fields. The utility of these methods is to generate new transduction mechanisms by which chemical and biological sensors can be developed. Complex liquid droplets behave as optical lens systems and small changes in surface tensions can change focal lengths or cause systems to switch between optically transmissive or scattering states. Central to this scheme is that the fluids in the droplets have different densities and hence are aligned by the earth's gravity. The induced optical changes can be triggered with chemical, photochemical, or biochemical stimuli and thereby create new generations of sensors. Demonstrations of these methods for the detection of enzyme concentrations, pathogens, and antibodies will be presented. Droplets containing birefringent liquid crystals (LCs), including chiral nematic phases, have been prepared and designer surfactants cause either planar of vertical anchoring at the water-liquid crystal interface. The liquid crystals can be used for precise positioning of magnetic particles and biomolecular elements. Magnetic particles can be used to create novel optical functions, including steering of light and selective reflection, which will be detailed.

LC Droplets with Complex Internal Arrangements



SmA and SmC N* (Chol)