Biologically-Inspired Designs of Responsive Liquid Crystalline Materials

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Reception at 3:30 p.m. PAA A110

Abstract

The unique combination of long-range molecular ordering and mobility found in liquid crystals has been exploited by nature to create a range of functional and living materials. Inspired by biological designs, we are pursuing studies that seek to realize synthetic liquid crystalline materials that integrate ideas related to the engineering of strain and defects. In one approach, we are exploring the use of elastic strain within liquid crystalline droplets to create dynamic templates that can be used to synthesize chemically patchy and non-spherical particles. In a second approach, we have used the nanoscopic physical environments created by topological defects to direct the self-assembly of biological amphiphiles in ways that have strong analogies to polymer-templated self-assembly processes. Such systems form the basis of new materials that permit ordering to propagate from the nanoscale to the optical scale with remarkable sensitivity. In a third approach, we are using the anisotropic mechanical properties of biocompatible liquid crystals to design materials than can be used to regulate the organization and function of living bacterial systems. These various lines of investigation, which encompass a broad range of colloidal and interfacial phenomena involving liquid crystals, will be discussed. Fundamental challenges and technological opportunities will be described.

Speaker Biography

Nicholas Abbott received a Bachelor of Engineering (Chemical Engineering) from University of Adelaide, Australia in 1985, and a PhD in Chemical Engineering from Massachusetts Institute of Technology in 1991. He was a postdoctoral fellow in the Chemistry Department of Harvard University from 1991-1993. He is currently the Sobota Professor and the Hilldale Professor of Chemical and Biological Engineering at University of Wisconsin-Madison. He is also Director of the Wisconsin Materials Research Science and Engineering Center. His research interests focus on colloid and interfacial phenomena, and include (i) active control of surfactants, (ii) design of stimuli-responsive materials based on liquid crystals, (iii) colloidal self-assembly, and (iv) biological interfaces. He is a Fellow of the American Association for Advancement of Science and a Member of the US National Academy of Engineering. He currently serves as Editor-in-Chief of *Current Opinion in Colloid and Interface Science*, and is on the editorial boards of *Langmuir* and *Surface Science*.