Polyelectrolyte Complex Membranes for Water Purification

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Abstract

Polyelectrolyte complexes are a fascinating class of soft materials that can span the full spectrum of mechanical properties from low-viscosity fluids to glassy solids. This spectrum can be accessed by modulating the extent of electrostatic association in these complexes, either by changing the structure of the component polymers are by or by adding salt to the system. With an appropriate choice of polyelectrolytes it is possible to design a system that can be dissolved in aqueous solutions of high ionic strength, but which which separates into polymer-rich and water-rich phases when the salt concentration is decreased. Porous membranes can be produced by a salt-induced phase inversion process that is conceptually similar to the common solvent-induced phase inversion process used to produce porous polymeric membranes. The properties of these membranes and a preliminary assessment on their utility in water purification applications will be discussed.

Short Biography

Ken Shull is Professor of Materials Science and Engineering at Northwestern University. His research interests involve the interfacial properties of polymers, with a particular emphasis on adhesion, fracture and the behavior of thin films and coatings. Recent interests include the large-strain deformation and fracture behavior of 'soft' materials including polymer nanocomposites, the mechanical properties and phase behavior of polyelectrolyte complexes, and advanced uses of the quartz crystal microbalance.

He received B.S. and M.S. degrees in Materials Science from MIT, followed by a Ph.D. in Materials Science from Cornell University, which he received in 1990. He worked as a research staff member at the IBM Almaden Research Center for 3 years before joining Northwestern University in 1993. He is a fellow of the American Physical Society and of the Adhesion Society.

He is a past president of the Adhesion Society, served as chair of the Adhesion Gordon Research Conference for 2013, and is the 2016 recipient of the Adhesion Society Award for Excellence in Adhesion Science.