Structured Polyelectrolyte Multilayers
April 20th, 2012
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Dr. Zacharia's research group works on soft matter, focusing on polyelectrolyte multilayers as well as asymmetrically functionalized colloidal particles. Polyelectrolyte multilayers are thin polymer films created by the directed complexation of oppositely charged polyelectrolytes. Asymmetrically functionalized particles such as Janus or "patchy" particles may assemble to form new phases and are useful in stabilizing Pickering emulsions. The group takes inspiration from biological structures as well as utilizes self-assembly mechanisms found on the micro and nano-scale in order to create complex structures. Electrostatic interactions, phase separation, and capillary condensation are examples of these. Of particular interest are new and innovative ways to both assemble and pattern these polyelectrolyte films. Patterns are formed using various stamping and imprint techniques, taking advantage of the films' responses to environments of different pH or ionic strength. With these methods hierarchical structures are created as well as structures with controlled porosity and both physical and chemical gradients. These thin films have possible applications as membranes or biological tissue scaffolds.

Nicole Zacharia graduated from MIT in 2007 with a PhD in polymeric and biomaterials. After that she was a postdoc in the chemistry department of the University of Toronto from 2007 - 2009 until joining Texas A&M in the fall semester of 2009. Her research group works in the area of soft condensed matter focusing on polyelectrolyte based thin films and colloidal systems. She was a 2008 recipient of the Texas Space Grant Consortium New Investigations award for work on conductive thin films as well as a recent project from the Air Force Office of Scientific Research working on the fabrication of energy dissipating polymeric coatings.