

Responsive organic films for mesoscale control of functionality

Opportunity

Control of the mesoscale structure and response to environmental changes can be tailored in soft condensed matter. This can be done in polymeric materials by varying the interactions between individual monomers that make up the polymeric chain. The opportunity is to build new materials with novel, environmentally-responsive behavior.

Approach

Combine chemical synthesis and multiple non-destructive characterization to understand the thin-film structure and how to tune the inter- and intra-layer interactions to provide the desired functionality. Selective deuteration of the polymers and/or polymer segments combined with neutron scattering can yield new insights to unique thin-film structures.

Meso Challenge

Thin film multilayer structures can be self assembled or layer-by-layer deposited. The short range order combines with the long-range electrostatic interactions between the various layers to give the films their functionality.

Impact

Soft materials that respond in a controlled way to their environment can make impacts in numerous technologies ranging from opto-electrics (sensors) to dye release in the printing industry to controlled drug release.

References: Kharlampieva, Ankner, Rubinstein, and Sukhishvili, Phys. Rev. Lett. 100, 128303 (2008); Kozlovskaya, Ankner, O'Neill, Zhang, and Kharlampieva, Soft Matter 7, 11453 (2011).

