



~~Special Polymer Physics Seminar ~~

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301 Steidle Bldg.

Using Interfacial Manipulations to Generate Functional Materials from Nanostructured Polymers

As future technological progress necessitates the design and control of nanoscale devices, new methods for the facile creation of smaller features must be discovered. One sub-class of soft material, **block copolymers**, provides the opportunity to design materials with attractive chemical and mechanical properties based on the ability to assemble into periodic structures with nanoscale domain spacings. To employ block copolymers in many applications, it is essential to understand how interfacial energetics influence copolymer morphologies. Two areas of recent research in the group involve: (1) probing the effects of interfacial composition on block copolymer self-assembly using tapered block copolymers, and (2) generating gradient substrate and “free” surfaces for thin films block copolymer studies. In the first area, we are manipulating the interfacial region between blocks to control ordering transitions in tapered diblock copolymers and triblock copolymers. As an example of recent work, our normal and inverse tapered diblock copolymers show measurable decreases in the order-disorder transition temperature (T_{ODT}) relative to the corresponding non-tapered diblock copolymers; with the inverse tapered materials showing the greatest deviation in T_{ODT} . In the second area, we are manipulating polymer thin film interfacial interactions using discrete gradient methods to control the free surface interactions, and gradient arrays of assembled monolayers to influence the substrate surface interactions. In particular, our chlorosilane monolayer gradients permit rapid screening of the substrate/polymer interactions necessary to induce the desired nanostructure orientations in many block copolymer systems.