

4.1.9 CHARGED SURFACE INDUCED COPOLYMER MICELLIZATION

H. Cheng, M. Olvera de la Cruz, "Hydrophobic-Charged Block Copolymer Micelles Induced by Oppositely Charged Surfaces: Salt and pH Dependence," *Macromolecules*, **2006**, in press.

Reliable theoretical models are needed to take advantage of nanoscale phenomena. In this study NUNSEC researchers used a two-state model to analyze the possibility of inducing surface micellization of hydrophobic and charged block copolymers to form surface patterns by an oppositely charged surface.

The electrostatic attraction between the charged block and the charged surface induces diblock copolymer micellization on the surface at copolymer concentrations well below the critical micelle concentrations in the bulk. The researchers studied systems with *strong* charge groups that have fixed charge densities, and systems with *weak* charge groups that have solution-dependent degrees of ionizations. It was found that the addition of salt increases the critical surface micelle concentration when the electrostatic attraction between the charged blocks and the surface dominates the electrostatic repulsion among the adsorbed chains. At low salt concentration, the excluded volume has a minor effect on surface-induced micelles for systems with *strong* charge groups. However, in systems with *weak* charge groups, both the surface and block degrees of ionizations are determined self-consistently as a function of pH – the excluded volume decreases the pH effect on the polyelectrolyte degrees of ionization at surfaces.

This study provides a new method to create patterns and advances the understanding of position-controlled molecular self-assembly.

