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Neutron Reflectivity Measurement of Polymer-Surface Interaction RICHARD SHERIDAN, SARA ORSKI, MSED, Natl. Inst. of Stds. & Tech., RONALD JONES, nSoft Consortium, Natl. Inst. of Stds. & Tech., KATHRYN BEERS, MSED, Natl. Inst. of Stds. & Tech. — Liquid adsorption chromatography at critical conditions (LACCC) is a method of macromolecular separation that is simultaneously promising and problematic. There is a large parameter space for customization of surface properties and the ternary optimization of solvent, solute, and surface necessary to find ideal separation conditions. By creating 2D model substrates using polymers grafted to the interface, we create a system in which the adsorption process near critical conditions can be observed directly. In this way, we gain fundamental insight into the contribution of the interface to the LACCC separation process, which will be useful in the rational design of stationary phases for this technique. Thin polymer film swelling is in principle observable by a number of techniques, such as ellipsometry or quartz crystal microbalance with dissipation. However, we intend to observe the nanometer-scale shifts in polymer conformation at low grafting density. Therefore, we use neutron reflectivity to observe the process in the initial stages because of its relatively high contrast and sensitivity. We demonstrate this technique by emulating published polystyrene LACCC conditions in cyclohexane and dimethylformamide. We then calculate an interaction parameter directly related to the free energy of adsorption, and compare it to the adsorption partition coefficient derived from the literature LACCC experiment. These direct measurements are critical for description of a wide variety of interfacial dynamic processes.

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