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**Surface Dynamics and Structures of Swollen Polymer Brushes**[1]
MARK FOSTER, LIANG SUN, Dept. of Polymer Science, The University of Akron, BULENT AKGUN, Dept. of Chemistry, Bogazici University; NIST Center for Neutron Research; Univ. Maryland, SURESH NARAYANAN, X-ray Science Division, Argonne National Laboratory, JIM BROWNING, Chemical and Engineering Materials Division, Oak Ridge National Laboratory — The surface height fluctuations of a film of untethered linear polystyrene (PS) chains can be well described by a continuum hydrodynamic theory of overdamped capillary waves. When the chains in a film are tethered to the substrate to form a "dry", densely grafted PS brush, the surface fluctuations are dramatically suppressed so that they are no longer observable in the time and scattering vector windows available for X-ray Photon Correlation Spectroscopy (XPCS). Here, surface fluctuations of PS brushes highly swollen in toluene vapor are investigated using XPCS and the structures of these swollen polymer brushes are investigated using Neutron Reflectivity (NR). Surface fluctuations of densely grafted PS brushes are still strongly hindered and not observable even if the brush is substantially swollen in a good solvent vapor. When there is a condensed liquid toluene layer on top of the brush, the surface fluctuations are observed with a relaxation time orders of magnitude larger than that of a thick film of pure toluene.

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