Surface Dynamics Of Homopolymer Brushes

GOKCE UGUR, BULENT AKGUN, The University of Akron, Akron, OH 44325-3909, ZHANG JIANG, SURESH NARAYANAN, X-ray Science Division, Argonne National Laboratory, Argonne, IL 60439, SANGHOON SONG, HEEGU LEE, Department of Physics and Interdisciplinary Program of Integrated Biotechnology, Sogang University, Seoul 121-742, Korea, WILLIAM J. BRITTAINE, The University of Akron, Akron, OH 44325-3909, HYUNJUNG KIM, Department of Physics and Interdisciplinary Program of Integrated Biotechnology, Sogang University, Seoul 121-742, Korea, SUNIL K. SINHA, Department of Physics, University of California San Diego, La Jolla, CA 92093, MARK D. FOSTER, The University of Akron, Akron, OH 44325-3909

— The surface dynamics of polystyrene (PS) and poly(n-butyl acrylate) (PnBA) homopolymer brushes were investigated by X-ray photon correlation spectroscopy for the first time. Within the range of time (0.2 -1100 s) and length scale (0.2-5 um) studied, no fluctuations of the brush surfaces were detectable. When PS brushes of thicknesses in the range of 9-101 nm and high grafting density (>0.5 chains/nm²) were considered at temperatures up to Tg+130C, no relaxation was visible within our window of in-plane wave-vector. Even reduction of the grafting density from 0.6 to 0.1 chains/nm² did not bring the relaxation into the window. Likewise, no relaxation was observed for PnBA brushes up to 170C above Tg. The suppression of surface fluctuations is a result of covalent tethering.