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Surface and Interface Structure of Diblock Copolymer Brushes
GOKCE UGUR, BULENT AKGUN, WILLIAM J. BRITTAIN, MARK D. FOSTER, The University of Akron, XUEFA LI, JIN WANG, Argonne National Laboratory — Internal and surface structure of polystyrene-*b*-polyacrylate diblock copolymer brushes have been studied using grazing-incidence small-angle X-ray scattering (GISAXS) and atomic force microscopy (AFM). Polystyrene-*b*-polyacrylate and polyacrylate-*b*-polystyrene brushes were synthesized using atom transfer radical polymerization. Poly(methyl acrylate) (PMA) or poly(*n*-butyl acrylate) (P*n*BA) was used as the acrylate block. Each asymmetric as-deposited diblock brush with a sufficiently large χN value shows an internal lateral structure with a spacing comparable to the thickness of the PMA layer. After a brush is treated with a selective solvent which is a good or theta solvent for the bottom block and poor solvent for the top block, Bragg rods appear in the GISAXS pattern. The lateral spacing corresponding to the Bragg rods is on the order of the total thickness of the brush. This lateral correlation is also detected by power spectral density analysis of AFM images made using tapping mode. The Bragg rods disappear upon heating to 80 °C.

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