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Investigating the Morphology and Dynamics of Thin Films of Diblock Copolymers on Chemically Nanopatterned Substrates of Varying Interfacial Energy and Pattern Quality ERIK W. EDWARDS, M.P. STOYKOVICH, PAUL F. NEALEY, University of Wisconsin Madison, H.H. SOLAK, Paul Scherrer Institut, C.J. HAWKER, IBM Almaden — The convergence of technologies to tailor interfacial interactions between polymer films and surfaces and to precisely pattern at the nanoscale has resulted in a wealth of important information about the physics of block copolymer thin films. We patterned stripes of SiO_x and polymer brushes of varying styrene and methyl methacrylate compositions with periods, L_s using EUV interferometric lithography and investigated the morphology and dynamics of ordering in PS-*b*-MMA films with a bulk lamellar period L_o . Perfect epitaxial ordering, pattern registration and the range of periods, L_S where perfect ordering occurs has been found to depend on the contrast in interfacial energy of the chemical patterns and the ratio of the widths of the SiO_x/brush stripes. The final morphologies were captured by a phenomenological model that predicts equilibrated structures based on chain stretching, interfacial interactions and copolymer/substrate interactions. The dynamics of ordering occurs as follows: a hexagonally close packed morphology forms which transitions to lamellar structures. The dynamics of perfect microdomain ordering has been found to depend on the interfacial energy contrast of the patterns and the commensurability of L_s and L_o .

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