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Highly enhanced dynamics of microdomains ordering by solvent vapor annealing of thin block copolymer films on polymer network supports LARISA TSARKOVA, ANJA STENBOCK-FERMOR, ALEXANDER BÖKER, DWI at the RWTH Aachen University, ARMIN KNOLL, IBM Research, DWI TEAM[1], IBM RESERACH COLLABORATION[2] — We studied the solvent driven ordering dynamics of block copolymer films supported by a densely cross-linked organic hard mask (HM) designed for lithographic fabrication. We found that the ordering of microphase separated domains on the HM layer proceeds significantly faster as compared to similar films on silicon wafers. This leads to a pronounced enhancement of the dynamics of both the terrace-formation as well as the long-range lateral ordering of the microdomains. The effect is independent on the chemical structure and volume composition of the studied block copolymers (cylinder-/ lamella-forming). Importantly, enhanced ordering is achieved even at a reduced degree of swelling corresponding to an intermediate to strong segregation regime, when similar films on conventional substrate show very limited ordering. In-situ ellipsometric measurements of the swollen films revealed an insignificant increase by 1-3 vol. % in the solvent up-take by HM-supported films. Therefore we attribute the enhanced dynamics to reduced interactions at the block copolymer/HM-support interface. Apart from immediate technological impact in block copolymer-assisted nanolithography, our findings convey novel insight into effects of molecular architecture on polymer-solvent interactions.

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