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Phase segregation at the sub-5-nm scale using high χ Poly(ethylene oxide-b-dimethylsiloxane) copolymers DAMIEN MONTARNAL, GLENN FREDRICKSON, EDWARD KRAMER, CRAIG HAWKER, Materials Research Laboratory, UCSB — Silicon containing block copolymers, such as Poly(styrene-b-dimethylsiloxane) (PS-PDMS), have recently received significant attention for nanolithographic applications [Jung et al., Nano Letters 2010, 10, 1000]. PDMS provides indeed a robust and highly selective mask to oxygen reactive ion etching. In addition, the high Flory-Huggins $\chi_{PS-PDMS}$ parameter (about 0.3 at room temperature) favors the segregation of low molecular weight (16 kg/mol) block copolymers (BCPs) into well-organized structures with pitch as small as 17 nm. In an effort to downscale further the size of structures formed by BCP, we decided to turn to copolymers with even higher χ parameters. Copolymers of Poly(ethylene oxide) (PEO) and PDMS are known to have extremely high χ parameters (0.4 -1.1) [Galin et al., Macromolecules, 1981, 14, 677], but their bulk and thin film properties have not been investigated in detail. PEO-PDMS BCPs were synthesized by chain coupling *via* a versatile copper-activated azide-alkyne click reaction. The unusually high χ parameter between EO and DMS allowed strong phase segregation to occur in copolymers with molecular weight as low as 5kg/mol. The full pitch were found to be less than 10 nm and we report on their bulk and thin film characteristics.

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