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Directed self-assembly of Si-containing block copolymer thin films in topographical templates

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Block copolymer films in which one block contains Si are attractive for nanolithographic applications due to the high etch contrast and etch resistance of the Si-rich block. We describe the microphase separation of thin films of such polymers on topographic templates made either by electron-beam writing or by etching of another block copolymer film. The self-assembled morphology is governed by the commensurability between the block copolymer and the template, and both periodic and aperiodic patterns such as meanders and junctions can be directed by appropriate template designs. Different morphologies can be formed in one block copolymer film by sequential solvent anneal steps. Results for directed assembly of diblock copolymers and triblock terpolymers are understood through 3D self consistent field theory modeling.