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Self-Assembly of Diblock Copolymers on Modified and Patterned Surfaces[1]

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The self assembly of diblock copolymer thin films into lamellar and cylindrical structures has been proposed as a method of creating small patterns in polymer thin films for electronic materials applications. A key obstacle, however, is inducing the resulting structures to align perpendicularly, rather than parallel, to the substrate. In this talk, we present our simulation results relating to some strategies which have been pursued by experimentalists to overcome the above goal. One part of this talk will focus on the self-assembly of block copolymers on a homogeneously grafted random copolymer brush composed of the species present in the diblock copolymer. Our study focuses on the "neutral window" and examines its dependencies on grafting density, relative chain length between the free and grafted polymers, and blockiness of the random copolymer chains. The second part of this talk will focus on the case of inhomogeneously patterned surfaces and identify the interplay between pattern width and the surface free energies in influencing the alignment in block copolymer films.

[1]NSF DMR; Army Research Office; Welch Foundation