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Theoretical and Experimental Investigations of Contact Hole Shrink using PS-PMMA Block Copolymers VALERIY GINZBURG, PHILLIP HUSTAD, JEFFREY WEINHOLD, RAHUL SHARMA, VIVIAN CHUANG, PETER TREFONAS, The Dow Chemical Company — One possible application of block copolymer directed self-assembly (DSA) involves rectification or "shrink" of contact holes in a polarity switched photoresist (see, e.g., J. Cheng et al., ACS Nano 8, 4815 [2010]). The block copolymer (e.g., PS-PMMA) undergoes ordering inside the cylindrical hole; the central (PMMA) domain is then etched out so that the hole diameter is effectively reduced. We utilize strong segregation theory (SST) and numerical self-consistent field theory (SCFT) to calculate the phase behavior of the block copolymers as function of their molecular weight and composition, as well as the contact hole diameter and the surface chemistry of the walls. The model predictions were compared with experimental data, and a good agreement was found. The results illustrate how modeling can serve to guide block copolymer selection for DSA contact hole rectification application.

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