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Designing a Cubically Packed Contact Hole Template based on a simple Flat Plate Confinement of di-Block Copolymers: A Coarse-Grained Molecular Dynamics Study SHUBHAM PINGE, Cornell University, GUANYANG LIN, DURAIRAJ BASKARAN, MUNIRATHNA PADMANABAN, RD Center, EMD Performance Materials Corp., YONG JOO, Cornell University — Using a large-scale coarse-grained molecular dynamics framework, we investigate the interplay between confinement length and morphology formed by asymmetric di-block copolymers (BCPs) like PS-b-PMMA with 30 vol % minor phase under various confinements by surfaces selectively biased towards the minor phase. In particular, we demonstrate that a length scale argument in a simple flat plate confinement can offer a predictive tool in designing the confined morphology formed in an intricate nano-lithographic template such as cubically packed pillars. Studies on a tight confinement of BCPs between two flat plates with separation of 17 show the presence of a critical polymer chain length above which a transition from a 3-layers of minor domain to 2-layers is observed. Relaxing the confinement length to 42 showed a transition from multi-layer morphology (¿3) to a three layer morphology. These results are used to design a topographic template of cubically packed pillars forming cubically packed contact-hole patterns. The least and largest radial separation between adjacent pillars are kept at 17 and 42, respectively. A direct correlation was observed in the number of minor domain layers of the maximum and minimum confinement dimensions with the 17 and 42 flat plate trials.

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