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Cyclic Solvent Vapor Annealing for Rapid, Robust Vertical Orientation of Features in BCP Thin Films SEAN PARADISO, KRIS DELANEY, GLENN FREDRICKSON, Univ of California - Santa Barbara — Methods for reliably controlling block copolymer self assembly have seen much attention over the past decade as new applications for nanostructured thin films emerge in the fields of nanopatterning and lithography. While solvent assisted annealing techniques are established as flexible and simple methods for achieving long range order, solvent annealing alone exhibits a very weak thermodynamic driving force for vertically orienting domains with respect to the free surface. To address the desire for oriented features, we have investigated a cyclic solvent vapor annealing (CSVA) approach that combines the mobility benefits of solvent annealing with selective stress experienced by structures oriented parallel to the free surface as the film is repeatedly swollen with solvent and dried. Using dynamical self-consistent field theory (DSCFT) calculations, we establish the conditions under which the method significantly outperforms both static and cyclic thermal annealing and implicate the orientation selection as a consequence of the swelling/deswelling process. Our results suggest that CSVA may prove to be a potent method for the rapid formation of highly ordered, vertically oriented features in block copolymer thin films.

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