Self-assembly of block copolymer thin films sandwiched by neutral polymer layers via initiated chemical vapor deposition for sub-10 nm nanoscale patterning

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The self-assembly of block copolymer (BCP) thin films has attracted tremendous attention as an alternative technology to conventional lithography. To form perpendicular microdomain useful for patterning, neutral layers were deposited via initiated chemical vapor deposition (iCVD) to overcome the disparate surface energies of the BCP blocks. The poly (divinylbenzene-co-methacrylic acid) (p(DVB-co-MAA)) ultrathin film by iCVD was used as top and bottom neutral layers. Neutrality of these layers is endowed by controlling the ratio of DVB and MAA. Using this strategy, non-preferential bottom layer was successfully demonstrated. Due to the high flux of radicals onto the film surface during iCVD of the top layer, the top layer grafts to the BCP surface. Hence, even when a non-neutral layer such as pDVB is deposited as the top layer, perpendicular orientation is promoted. As a result, we successfully demonstrate perpendicular cylinders having a domain spacing of 11.7 nm. In conclusion, we show that iCVD can efficiently make neutral films and act as platform for the further development of BCP lithography.