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Vertical Continuity and Alignment of Block Copolymer Domains by Kinetically Controlled Electrospray Deposition HANQIONG HU, YOUNGWOO WOO, XUNDA FENG, CHINEDUM OSUJI, Yale University, OSUJI LAB TEAM — We report the fabrication of vertically aligned cylindrical block copolymer (BCP) domains using continuous electrospray deposition (ESD) onto bare wafer surfaces. The out-of-plane orientation of hexagonally packed styrene cylinders was achieved in a "fast-wet" deposition regime where rapid evaporation of solvent in droplets of polymer solution drove the vertical alignment of SBS domains. The deposition conditions were optimized such that thermally activated crosslinking of the polybutadiene matrix provided kinetic control of the morphology, locking in the vertical alignment and preventing relaxation of the system to its preferred parallel orientation on the non-treated substrate. Physically continuous and vertically oriented domains is achieved over several microns of film thickness. We describe the effects of flow rate, collection distance and substrate temperature on thin film morphology and demonstrate selective etching capabilities. The ability of ESD to fabricate well-ordered and aligned BCP films on non-treated substrates, the low utilization of material relative to spin-coating and the continuous nature of the deposition may open up new opportunities for BCP thin films. We are exploring ESD as a new platform for sequential deposition of BCPs with different functionalities.

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