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Ordered Deposition of Block Copolymer Thin Films and Its Continuous Growth by Electrospray HANQIONG HU, CHINEDUM OSUJI, Yale Univ. — Ordering of block copolymer thin films have been studied extensively using different approaches primarily as a post-deposition step. Here we show that well-ordered block copolymer thin films can be continuously deposited through electrospray. Under appropriate conditions, fine particles are generated and sub-attoliter quantities of material is delivered and equilibrated with heated substrate in the presence of solvent-mediated interface. Ordered film formation is predicated on fast thermal equilibration relative to the rate of deposition. We investigate the effects of process parameters that underpin film morphology including solvent selectivity, substrate temperature, flow rate of electrospray feed solution and wetting conditions in a couple of material systems, such as PS-b-PEO, PS-b-PMMA and PS-b-P4VP. We've demonstrated that at relative fast deposition rate ($\sim$ 5nm/min), solvent assists ordering of the film and its selectivity plays an important role in determining the film morphology as it mediates the interface preference regardless of the wetting conditions. We also observe wide temperature and flow rate windows for the film to be ordered. Cylinders were found to align with their long axes perpendicular to the film-air interface at optimal spray conditions. When the material is delivered free of solvent at relative slow deposition rate ($\sim$ 10nm/h), templated substrate or neutral wetting conditions becomes key to ordering of the film and continuity of perpendicular growth is expected under such.

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