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Controlling Pattern Formation in Polymer and Nanoparticle Assemblies via Programmed Flow-coating HYUN SUK KIM, MARK MCDONOUGH, SAM PENDERGRAPH, ALFRED CROSBY, Polymer Science and Engineering Department, University of Massachusetts — We have developed a novel flow-coating method for assembling periodic polymer and nanoparticle line patterns with controlled spacing and width of lines. In flow-coating, a dilute polymer and/or nanoparticle solution is held by capillary forces under a stationary knife blade fixed at gap height above a substrate fixed to a translating stage. Upon translating the substrate, spontaneous formation of convective polymer and nanoparticle assemblies occurs at the three-phase contact line of the meniscus. We demonstrate that the width and spacing of deposited lines can be controlled over a wide range by using programmed velocity profiles for the translating stage. Deposition of solutes is induced when contact lines are "stick" at slow or zero velocity, while limited deposition occurs during "slip" at high velocity. We investigate the effect of gap height, concentration, and velocity on the pattern formation This new method provides an easy, robust, and lithography-free method to control the deposition of line pattern of polymers and nanoparticles for various applications.

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