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Creating Controlled Thickness Gradients in Polymer Thin Films via Flowcoating RALEIGH DAVIS, SAHANA JAYARAMAN, RICHARD REGISTER, Princeton University, PAUL CHAIKIN, New York University — Flow coating is a technique which has a unique capacity to create polymer thin (10-1000 nm) films which possess a thickness gradient. This has greatly enhanced the throughput of many experiments which seek to investigate the effect of film thickness on polymer structure or properties by enabling one to study a wide range of film thicknesses using only a single flowcoated sample. Until recently, there was limited understanding of how to predict or control the film thickness profiles generated with this device. A recently published first-principles approach uses Landau-Levich theory to derive an equation which identifies the experimental variables which are thought to govern film thickness. These parameters are the capillary number (a function of the solution viscosity, surface tension, and coating blade velocity) as well as the gap height between the blade and the substrate. In this work, many of these experimental variables, as well as some others, were varied and the resulting film thickness values showed excellent quantitative agreement with the model. These results, coupled with the first principles model, provide a design method which allows a user to produce polymer thin films of virtually any desired thickness profile.

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