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Patterning Multicomponent Polymer Thin Films via Dynamic Thermal Processing

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Bottom-up patterning is gaining increased importance owing to the physical limitations and rising costs of top-down patterning. One example of bottom-up patterning is self-assembling polymer thin films. Although there are several pathways to facilitate polymer thin film self-assembly, this presentation will focus on dynamic thermal field based processes for patterning multicomponent polymer thin films. Dynamic thermal field processing is an attractive rolltoroll (R2R) amenable directed selfassembly (DSA) method for molecular level organization of multicomponent polymer systems such as block copolymer thin films over large areas without requiring guiding templates. The talk will first outline how parameters such as magnitude of the temperature gradient, velocity of annealing, thermal expansion, and molecular weight of the polymer can be optimized to finely tune the morphology of the block copolymer thin films and also elucidate their associated physical mechanisms. The second part of the talk will outline application of dynamic thermal field processes for fabricating functional nanomaterials and discuss the recent advancements achieved using these processes.