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The Alignment of Ion-Complexed Symmetric Diblock Copolymer Thin Films under an Electric Field JIA-YU WANG, University of Massachusetts, Amherst, TING XU, University of California, Berkeley, JULIE LEISTON-BELANGER, SURESH GUPTA, University of Massachusetts, Amherst, JAMES SIEVERT, THOMAS RUSSELL, University of Massachusetts, Amherst —
In symmetric polystyrene-*block*-poly(methyl methacrylate) (PS-*b*-PMMA) diblock copolymer thin films, lithium ions were successfully introduced to form lithium-PMMA complexes that markedly enhanced the alignment of BCP microdomains under a DC electric field, even adjacent to the two interfaces. The origin of improved alignment arises from the increased dielectric constant difference between the PS and PMMA blocks which reduces the critical field strength required to overcome interfacial interactions of the blocks. Furthermore, χ was significantly increased with the formation of the lithium-PMMA complexes, resulting in a transition in the orientation mechanism of the lamellar microdomains from a disruption and reformation of the microdomains to a grain rotation mediated by movement of defects. The formation of large grains amplifies the ability of the external electric field to overcome preferential interfacial interactions and eliminate defects. Consequently, complete alignment of BCP microdomains can be achieved. By controlling the number of lithium-PMMA complexes, the microdomain alignment can be regulated in PS-*b*-PMMA thin films.

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