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Ordering and Orienting Block Copolymer Nanostructures: The Influence of Ions. Thomas P. Russell, Polymer Science and Engineering Dept., Univ. of Massachusetts, Amherst, MA 01003.

The directed self-assembly of block copolymers is emerging as a simple tool for the fabrication of nanostructured materials. Trace ionic impurities or added salts are shown to have profound influence on the ease of orienting arrays copolymer microdomains and on inducing ordering transitions that can reduce the size scale of the domains to the nanometer level using an applied electric field. Complexation of one of the blocks with salt is shown to markedly increase the segmental interactions, as evidenced by the narrowing of the interfacial width determined from neutron reflectivity measurements. In addition, the complexation, coupled with controlled solvent evaporation, is shown to provide a simple route to induce highly oriented arrays of the copolymer microdomains having long-range lateral order. By controlling the level of ions in the copolymer, the time scale over which the domains are ordered and oriented is markedly increased. Consequently, an avenue is opened in enhancing the processing of these versatile materials and opening potential routes to addressable nanostructured materials.