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Selective Stabilization of the Fddd Diblock Copolymer Microphase in an Applied Electric Field JONATHAN MARTIN, WEI LI, KRIS DELANEY, GLENN FREDRICKSON, Univ of California - Santa Barbara — Using self-consistent field theory, we explore the phase behavior of AB diblock copolymer melts in a uniform applied electric field. We assign an isotropic polarizability to each monomer type, such that the electric field selectively destabilizes AB interfaces that are perpendicular to the applied field. Under the mean-field approximation of the present model, lamellar and cylindrical structures align such that their AB interfaces are parallel to the electric field, and their relative stability with respect to the disordered phase is unchanged. Sphere and network phases do not have an axis of uniformity, so the preferred orientation for each of these phases must be identified by simulation. Small distortions in morphology are induced by the electric field for these phases, such that the free energy response includes non-harmonic terms. We compute the phase diagram for a melt in an applied electric field by comparing free energies of each morphology at its preferred orientation. We find that the stability regions for the sphere and network phases shrink with increasing electric field strength. Moreover, the double gyroid phase is relatively destabilized against the Fddd phase, extending the stability region for the Fddd phase to larger segregation strengths.

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