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Structure and Phase Behavior of Tapered Diblock Copolymers from Self-Consistent Field Theory JONATHAN R. BROWN, The Ohio State University, SCOTT W. SIDES, National Renewable Energy Laboratory (NREL), LISA M. HALL, The Ohio State University — Tapered block copolymers are like AB diblock copolymers with a "tapered block" inserted between the A and B endblocks. This tapered block sequence is random with its average composition changing linearly from pure A to pure B (or B to A for inverse-tapered systems). Depending on the fraction of A monomers and the quantity χN, the blocks microphase separate to form various ordered morphologies. Increasing N (such as to improve mechanical properties) simultaneously affects the microphase separated state. Tapering adds another adjustable parameter, taper length, that can be used to control the microphase separated state. We map the phase diagrams of model tapered and inverse tapered polymers using self-consistent field theory (SCFT). The ordered phases shift to higher χN for tapered systems, and the shift increases as the taper length increases. Inverse tapers shift the phase diagram to even higher χN. Direct tapered systems' phase diagrams are like those of diblocks, but with a larger gyroid region. For large inverse tapered systems, the polymer appears like an ABAB tetrablock, and it folds across the interface or bridges between domains. In this case some of the ordered structures show reversed A and B domains where the majority phase is relatively impure.

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