Phase Behavior of Ternary Homopolymer/Diblock Blends: Influence of Relative Chain Lengths

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We study the phase behavior of ternary blends of A and B homopolymers and symmetric, or slightly asymmetric, AB-diblock copolymer as obtained from self-consistent field theory. We choose one value of the segregation in the weak to intermediate regime and determine the effects of varying the relative degrees of polymerization of the components. The diagrams we obtain, which contain the classical lyotropic phases, exemplify and make concrete a few general principles. Homopolymers longer than the diblocks are expelled from the microstructure, while homopolymers of comparable length swell the microstructure, a swelling which can proceed indefinitely. Very short homopolymers disorder the microstructure. Our results can be understood as due to the varying ability of homopolymers of different length to swell the brush formed by the diblock at the internal interfaces.