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(G) Bicontinuous microemulsion in binary blends of complimentary diblock copolymers

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The phase behavior of binary blends of AB diblock copolymers of compositions f and 1-f is examined using field theoretic simulations (FTSs). Highly asymmetric compositions (i.e., f ≈ 0) behave like homopolymer blends macrophase separating into coexisting A- and B-rich phases as the segregation is increased, whereas more symmetric diblocks (f ≈ 0.5) microphase separate into an ordered lamellar phase. In self-consistent field theory, these behaviors are separated by a Lifshitz critical point at f= 0.2113. However, its lower critical dimension is believed to be four, which implies that the Lifshitz critical point should be destroyed by fluctuations. Consistent with this, the FTSs find that it transforms into a tricritical point with a lower critical dimension of three. Furthermore, the highly swollen lamellar phase near the mean-field Lifshitz critical point is transformed into a bicontinuous microemulsion (BµE), consisting of large interpenetrating A- and B-rich microdomains. The BµE has been previously reported in ternary blends of AB diblock copolymer with its parent A- and B-type homopolymers, but in that system the homopolymers have a tendency to macrophase separate from the microemulsion. Our alternative system for creating BµE should be less prone to this macrophase separation.

Keyword-1

block polymers

Keyword-2

microemulsion

Keyword-3

Lifshitz critical point

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