χNdependence of Composition Fluctuation Inhomogeneity on Transition Behavior of Diblock Copolymers

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We propose that the thermodynamic segregation power of χN at the order-to-disorder transition ($(\chi N)_{ODT}$) is a key parameter on block copolymer (BCP) to influence the composition fluctuation inhomogeneity at ODT, where χ is the Flory-Huggins interaction parameter between two blocks and N is the overall degree of polymerization. For this purpose, a series of symmetric BCPs of polystyrene-*b*-poly(2-vinlyprydine) (PS-*b*-P2VP), PS-*b*-poly(methyl methacrylate) (PS-*b*-PMMA), and PS-*b*-poly(*n*-hexyl methacrylate) (PS-*b*-P*n*HMA) with modest molecular weights were prepared to represent the decreasing $(\chi N)_{ODT}$ order of $(\chi N)_{PS\text{-}b\text{-}P2VP} > (\chi N)_{PS\text{-}b\text{-}PMMA} > (\chi N)_{PS\text{-}b\text{-}PnHMA}$. The differential scanning calorimeter (DSC) and small angle x-ray scattering (SAXS) were used to support that the discontinuous changes in local composition profiles at ODTs become more distinct when the fluctuation-induced $(\chi N)_{ODT}$ of BCPs decreases.