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Flory χ of the homologous series of deuterated polystyrene-b-poly(n-alkyl methacrylates): small angle neutron scattering and theoretical studies DU YEOL RYU, Yonsei University, KRISTOPHER A. LAVERY, THOMAS P. RUSSELL, University of Massachusetts at Amherst, JUNHAN CHO, Dankook University, DONG HYUN LEE, JIN KON KIM, Pohang University of Science and Technology — We have performed small angle neutron scattering and theoretical studies of the homologous series of deuterated polystyrene-b-poly(n-alkyl methacrylates) from methyl to n-hexyl groups that cover from UODT (upper order-disorder transition) to LODT (lower DOT), and barotropic to baroplastic behavior. It was shown that the effective Flory χ from the measurements reveal a monotonic dependence on 1/T for UODT (methyl, n-hexyl) systems and a complicated dependence for LDOT (ethyl to n-pentyl) systems. The recently developed compressible random-phase approximation (RPA) analysis has been applied to the copolymers to interpret in a unified way such diversified temperature and pressure dependence of χ and the transitions. Specific interactions (SI) and compressibility were incorporated through the RPA interaction fields in this theoretical approach. It was argued that the SI gives a major contribution to the LDOT behavior and the complicated dependence of χ on 1/T. The compelling changes in χ and the pressure responses of transitions according to the pendant group size were also interpreted successfully with the theory.

Junhan Cho
Dankook University

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