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Effects of Blockiness on the phase behavior of random copolymers

GORDON VANDERWOUDE, AN-CHANG SHI, McMaster University — Theoretical study of random block copolymers remains a challenging topic due in part to the sheer enormity of their phase space. In this study we use the self-consistent field theory to investigate the phase behaviour of linear (AB)n-type and (AB)n-C-type multiblock copolymers with randomly distributed A and B blocks. In particular, we examine the effect of blockiness of the random copolymers on the formation of ordered phases. The blockiness can be quantified by the average length of individual A or B blocks, which can be taken as a measure of the heterogeneity of the random copolymers. We observed that the critical value of the χ parameter, at which the order-disorder transition occurs, decreases with increasing blockiness in the (AB)n copolymers. We also observed that the phase behaviour of the (AB)n-C copolymers depends strongly on the blockiness of the random chain. In particular, the blockiness governs whether or not the A/B blocks can phase separate within the A/B domains, thus dictating whether the (AB)n-C behaves as A/B-C diblock copolymers or as ABC terpolymers. The theoretical phase diagrams will be compared with available experiments.

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