On the properties of poly(isoprene-b-ferrocenylmethyl methacrylate) block copolymers -

By combining poly(1,4-isoprene) (PI) with poly(ferrocenylmethyl methacrylate) (PFMMA) in a diblock copolymer structure by means of anionic polymerization we obtained narrowly dispersed PI-b-PFMMA copolymers with molecular weight ranging from 13000 to 62000 g/mol. The products were stable up to 228 °C, according to thermal gravimetry, which allowed us to further investigate their viscoelastic and X-ray scattering properties at elevated temperature by rheology and SAXS, respectively. For PI-b-PFMMA with total molecular weight 13400 g/mol a phase transition at 105 °C was identified leading to the segmental mixing at T > 105 °C and microphase separation at T <105 °C. The microphase separated morphology acquired hexahonally packed cylinder (HEX) microstructure in bulk. The explanation of the ordered HEX morphology was derived from a quantification of the thermodynamic immiscibility between PI and PFMMA segments via random phase approximation theory yielding generally accepted dependency of the Flory-Huggins interaction parameter (χ) on temperature.

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