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Tacticity effects on viscoelastic properties of polystyrenes[1]
CHIEN-LIN HUANG, CHI WANG, Department of Chemical Engineering, National Cheng Kung University — Polystyrenes (PS) with a similar molecular weight and distribution but different tacticities, i. e. syndiotactic (s-PS), atactic (a-PS), and isotactic (i-PS), have been used in this study for a fair comparison to reveal their differences in the viscoelastic properties. Our attention was focused on the influence of the PS tacticity on the rheological properties, especially the plateau shear modulus G_N^0 and entanglement molecular weight M_e. Based on the time-temperature superposition principle, the master curves of dynamic storage modulus $G'(\omega)$, dynamic loss modulus $G?(\omega)$, and $tan\delta$ at a reference temperature of 280^oC were constructed. The feasibility of conventional approaches for determining G_N^0, i. e. minimum $tan\delta$criterion, the integration method, and an empirical equation derived by Wu, has been discussed and compared; the corresponding M_e is then derived by the classical relation: $M_e = \rho RT/G_N^o$. Our results show that the measured M_e and activation energy for flow are similar for s-PS and a-PS, but the highest for i-PS. In addition, the zero shear viscosity of i-PS is ca. one order larger than that of s-PS and a-PS.

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