RHEOLOGICAL STUDIES OF PP/PE LAYERS AND PP/PE BLENDS WITH COMPATIBILISIZERS

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Many studies have addressed the polymer blends of polyethylenes and polypropylenes and their morphology/rheology relationships. Nevertheless, there were not many attempts to understand rheological behavior of interphase boundary of layers, which is important for enhancing mechanical performance of polymer blends. For this purpose, various number of layers of metallocene based PP/PE with narrow molecular weight distribution, which have less short chains between interphase boundary [1,2], and also Ziegler-Natta based PP/PE layers (with and without compatibilisizer) were used as a rheological case study. The rheological properties such as G´ (storage modulus), G´´ (loss modulus) and η* (complex viscosity) were investigated by applying amplitude sweep, time test, frequency sweep and shear recovery tests. Increasing the number of layers for metallocene based PP/PE was found to influence the rheological properties of molten polymer layers and in particular to increase the low frequency plateau for G´. This result was in agreement with shear recovery test. However, the obtained rheological data for Ziegler-Natta based PP/PE layers showed that there was no significant change in rheological properties with increasing the number of layers because accumulation of short chains at the interphase boundary in the polymer melts inhibited the formation of interfacial entanglements [1]. In this work, also PP/PE blends were evaluated to facilitate comparison of the rheological behavior between PP/PE layers and PP/PE blends.

[1] Poon, B.C., et al., Adhesion of polyethylene blends to polypropylene. Polymer, 2004. 45(3): p. 893-903.

[2] Chaffin, K.A., et al., High-Strength Welds in Metallocene Polypropylene/Polyethylene Laminates. Science, 2000. 288(5474): p. 2187-2190