

Effects of novel additives on processability of recycled linear polypropylene

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Linear polypropylene by itself does not have adequate melt strength for shaping by blow molding into bottles, or for producing closed cell foam. The melt strength can be improved sufficiently by compounding the linear polypropylene with 2 to 3 wt% of a suitable organically modified montmorillonite, along with functionalized polypropylene as compatibilizer. The recycled polymer will display effects of both temperature and flow. Hence the object of this paper was to investigate separately the effects of high temperature annealing without flow and of high shear in a melt rheometer on the melt strength of linear PP-clay nanocomposites with and without silane treatment on the organoclay. In this paper, additional silane treatment was carried out with different silane coupling agents on the organoclay and each organoclay was compounded with the same linear polypropylene and compatibilizer and in the same proportions. The results reveal that after annealing for up to five hours at 180C, silane treatment of the organoclay with dialkoxy aminoalkylsilane and with monoalkoxy aminoalkylsilane lead to compounds where the melt strength is preserved to the same extent. But after extrusion through a die at 500 s⁻¹, there is a marked difference between compounds with the two different coupling agents. The melt strength is preserved in the compound with the monoalkoxy silane treated clay. But with the other dialkoxy silane treatment, the melt strength deteriorates significantly after extrusion. These trends are explained by different changes in the nanostructure of the various compounds after annealing and extrusion, as found by X-Ray diffraction and by dynamic shear moduli of the melts.