Injection Molding of Syndiotactic Polystyrene/Organophilic Clay Nanocomposites.

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Abstract

Remarkable breakthroughs in catalyst and process development as well as an attractive combination of high performances have stimulated remarkable studies on Syndiotactic Polystyrene (sPS). To improve the competitiveness of sPS for engineering plastic applications, it is an important objective to simultaneously increase sPS processability, barrier properties and chemical resistance. In the last twenty years, polymer nanocomposites have received a significant attention because of their outstanding properties. In this work an attempt has been made to obtain a nanocomposite based on sPS with the aim of improving material performances.

To this goal, injection-moulding specimens made from neat Syndiotactic Polystyrene and commercial montmorillonite modified with various organic compound were prepared in different molding conditions. Dispersion of clay was obtained via melt blending directly in the injection chamber of the injection-molding machine. The obtained specimens were analyzed by IR spectroscopy, X-ray diffraction and thermal analysis with the aim to elucidating the effect of the clay on the microstructures that might contribute to the final properties.

Results clearly show that, depending on the organic modification, the presence of clay can induce strong effects on final crystallinity of the samples as well as on the processability of the sPS resin. In particular, it was find that the organic modification has a crucial effect on the dispersion of the clay in the polymer matrix. When an effective dispersion (intercalation and/or exfoliation) of the clay were attained, a significant reduction in the final crystallinity of the sPS samples, especially in the case of low injection temperature, were observed. sPS nanocomposites show a range of processing temperature much larger than that of the of neat sPS. In addition, the recordings of pressure history in different positions along the cavity during the injection tests show a strong reduction of material viscosity.