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## HIGH SHEARING DURING PROCESSING OF MONTMORILLONITE REINFORCED POLYPROPYLENE NANOCOMPOSITES

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The maximum property enhancement in nanoclays reinforced polymers is obtained when high levels of intercalation, exfoliation and dispersion of the nanoclay in the polymer matrix is achieved. Processing of polymer nanocomposites by melt blending techniques requires sufficient stress levels and time for a maximum exfoliation/intercalation of the nanoclays (with minimum polymer degradation), which is very limited in conventional polymer processing techniques.

Shear Controlled Injection Moulding, SCORIM is a non-conventional injection moulding techniques based on the concept of in-mould shear manipulation of the melt during the polymer solidification phase. This technique is able of applying high shearing levels to the polymer, leading to high levels of molecular orientation. SCORIM of nanoclay-based polymer nanocomposites may be therefore beneficial for achieving high levels of nanoclay intercalation/exfoliation and orientation, thus imparting improved mechanical properties.

In this work, a nanoclay based masterbatch was mixed with PP and direct injection moulded by conventional and SCORIM techniques. In SCORIM, two extreme shear levels were applied by changing processing conditions (melt temperature and shear time). We assess therefore the effect of high shear conditions in the levels of intercalation/exfoliation and orientation of the nanoclay in the polymer matrix and in the mechanical properties of the nanocomposite. The levels of clay intercalation/exfoliation and orientation were evaluated by Wide-Angle X-ray Scattering TEM and SEM, respectively. The microstructure of the moulding was characterized by polarized light microscopy and DSC. The mechanical behaviour was assessed by impact Charpy tests and fracture tests under quasi-static conditions. Polymer property reinforcement is determined by the incorporation of nanoclays and by processing. Besides influencing the nanoclay morphology (exfoliation and orientation levels), a strong coupling with the polymer morphology is also observed, evidencing the nanoclays as polymer morphology directors and thus determining the mechanical response.

**Keywords:** SCORIM, high shearing, nanocomposites, nanoclay intercalation/exfoliation