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Mechanical and Rheological Behaviors of Polypropylene/Montmorillonite Nanocomposites Prepared Through 'Master Batch' Approaches

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Fundamental studies of the 'Master Batch' approach to form polymer inorganic nanocomposites are presented. Specifically, the molecular weight (Mw) difference between matrix [polypropylene, PP] and functionalized polymer in the master batch [functionalized polypropylene, F-PP] was systematically investigated, and the effects of this Mw-difference on composite structure and material properties were studied. PP / F-PP / montmorillonite (MMT) nanocomposites were prepared from one F-PP / organophilic montmorillonite (OMMT) master-batch by melt-compounding with various neat PPs. Three kinds of PPs having different molecular weights (Mw) were used as the matrix. Morphological studies revealed intercalated and exfoliated OMMT layers throughout PP matrix, in all cases. Rheological studies showed better OMMT dispersion for the higher Mw PP matrix (in comparison with Mw of F-PP). These dispersion differences are also reflected in higher enhancements of tensile modulus for the higher Mw PP matrix (i.e. 20% increase of tensile modulus at 5wt% OMMT). Comparisons against MB with end-tethered PP on the MMT surfaces, and MB that mimic commercially available systems were also carried out, and will be presented.