330a Yield Stress and Chemical Coupling in Polypropylene-Clay Nanocomposite Melts

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The coupling in polymer nanocomposites between the matrix and layered silicates can be enhanced by both functionalized polymer and by silane coupling agents. When applied to layered silicates, the choice of silane coupling agent is particularly critical. Some silanes move into the interlayer galleries and react with the gallery faces, leading to stronger intercalated structures. Other silanes react with the edges alone and as seen from recent results obtained in our laboratory lead to a greater degree of exfoliation as well. This paper presents the yield stress of polypropylene nanocomposites prepared with various compatibilizers and different loadings of silated and unsilated clay. The yield stress is estimated from dynamic shear tests on the nanocomposite melts with the help of van Gurp-Palmen plots of delta (or arctan (G"/G')] vs. G*. The yield stress increases with the bound maleic anhydride fraction of the maleated polypropylene. The yield stress obtained with edge coupling and 5 wt% C-18 clay is 2200 Pa -- more than twice the value without the edge coupling.