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Rheology of Supercritical CO_2 dispersed Polymer/Clay Nanocomposites RANGARAMANUJAM KANNAN, STEVEN HORSCH, GANAPATHY SUBRAMANIUM, ESIN GULARI, Wayne State University — Effective dispersion of the fillers in a polymer matrix has been a key challenge in the field of nanocomposites. Supercritical carbon dioxide ($scCO_2$) appears , PS/clay, The nanocomposites are characterized using WAXD, SEM, TEM, Rheology and DSC. The high degree of dispersion achieved through sc-CO_2 appears to result in an order of magnitude increase in the rheological properties of PS, associated with an increase in the T_g of around 13 $^\circ$C, at 10% clay loading. These moduli improvements are significant better than those obtained with conventional, chemically-modified intercalated clay nanocomposites. The degree of enhancement in the properties appears to be strongly dependant on the polymer-clay interactions, and how it is promoted by the supercritical fluid. In the case of PDMS nanocomposites, where the clay-polymer interactions were weak, the modulus increase at low frequencies (for sc-CO_2 processed system) was only a factor of 2. In the case of PVME- I30P clay nanocomposites, the modulus increase was substantial even at moderate loadings and dispersions, perhaps to be hydrogen-bonding interactions. The clay and the polymer orientation and interactions in these nanocomposites are also being probed using rheo-optical FTIR spectroscopy.

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