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Supercritical CO_2 Processing: A Novel Method for Producing Highly Dispersed Clay-Polymer Nanocomposites STEVEN HORSCH, ESIN GULARI, RANGARAMANUJAM KANNAN, Wayne State University — The key challenges in producing high performance nanocomposites are separation of the layered filler into individual platelets, preservation of large aspect ratios and promotion of polymer-filler interactions. By exploiting the ability of $scCO_2$ to diffuse into the layered filler and solvate/swell polymers we have been able to disperse the nanoclay and facilitate polymer-clay interactions even with Na^+ montmorillonite. Nanocomposites are prepared by processing the pristine nanoclay and compounding it with an appropriate polymer or processing clay/polymer simultaneously. SEM and WAXD results show significant clay layer separation and preservation of platelet aspect ratios. A high degree of dispersion is also observed in TEM images of these nanocomposites. The facilitation of polymer-clay interactions during the $scCO_2$ process results in higher glass transition temperatures and improved dynamic moduli for these systems. For example, a 5wt% 93A/PS nanocomposite has a 10 degree increase in T_g and G' becomes nearly independent of frequency at low shear rates where it demonstrates an order of magnitude increase.

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