

Rheology and Morphology of Nano-Silica Containing Polypropylene and Polypropylene/Liquid Crystalline Polymer Blend

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The rheology and morphology of nano-silica containing PP and PP/LCP blend were studied. Samples were prepared with different concentration of two fumed silica types: hydrophobic and hydrophilic. The rheological results were used to calculate the percolation threshold, fractal index, and the intrinsic viscosity of PP/silica nanocomposites. It was found that hydrophobic silica has higher tendency for aggregation and forms bigger and denser aggregates. The lower percolation threshold and the higher fractal dimension for hydrophilic silica are due to its stronger particle-particle interaction rather than polymer-particle interaction compared to hydrophobic one. In PP/LCP/silica hybrid samples, it was found that while the hydrophobic silica has lower thickening capability and lower coalescence hindrance caused by smaller aggregates, it locates at the interface of PP/LCP blend and results in smaller droplet size and higher elasticity of hybrid samples in comparison to hydrophilic silica. The results suggest that the hydrophobic silica has a compatibilization capability for PP/LCP blend, while the hydrophilic silica mostly works as a thickening agent and suppresses the coalescence.