Characterization of polypropylene/polystyrene boehmite alumina nanocomposites: Impact of filler surface modification on the mechanical, thermal, and rheological properties

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ABSTRACT:

The influences of surface treatment and the concentration of boehmite alumina (BA) particles on polypropylene and polystyrene (PS) (80/20) blends produced via melt compounding were examined. The results show that p-toluene sulfonic acid-treated BA particles yielded the highest stiffness improvement (27.5%), followed by untreated particles (25.7%), and dodecylbenzene sulfonic acid-treated BA particles (8.5%). Transmission electron microscopy revealed that p-toluene sulfonic acid-treated BA particle agglomerates were dispersed in the PS phase, whereas untreated particles formed agglomerations at the interfaces. Dodecylbenzene sulfonic acid-treated particles were poorly dispersed in both matrices. Differential scanning calorimetry showed that both untreated and p-toluene sulfonic acid-treated BA particles acted as nucleating agents in the blend because of the shifting of crystallization peaks to higher temperatures by 12 and 8 °C, respectively. A significant increase in decomposition temperatures occurred upon 7 wt % loading of all types of BA particles into the blend. Heat deflection temperature measurements showed that all types of BA particles improved the thermal properties of the blend.