

Thermal properties of microsilica and nanosilica filled polypropylene composite with epoxy as dispersing aid

Abstract

Nanocomposite materials differ from the traditional composite materials in that they provide enhanced properties at comparatively low filler loading with respect to microsize filler. In this research work, silica filled polypropylene micro and nanocomposites were prepared and compared in terms of their thermal properties. Both composites were prepared by the melt blending method using a Thermo Haake internal mixer. Later, the epoxy resin was used as a dispersing aid to improve the adhesion between silica and polypropylene. For comparison purposes, 1% and 2% w/w of nanosilica filler is assumed to be comparable to 10% and 20% w/w of microsilica filler. Both composites at various compositions of fillers were subjected to thermal analysis including differential scanning calorimetry (DSC) and thermal gravimetric analysis (TGA). From DSC analysis, the melting point of micro and nanocomposites remain almost the same as neat polypropylene. By adding the nanosize filler into the composite system, an increase in the degree of crystallinity was observed. In general, the nanocomposites exhibited comparable or better properties over the microcomposites. The employment of epoxy resins as a dispersing aid has adversely affected the properties of the composites (i.e., nano and microcomposites). However, the results were encouraging at relatively low levels of filler loading.

Keywords — Epoxy resin, microcomposites, nanocomposites, silica, thermal properties