Comparison of In-situ polymerization and Solution-Dispersion Techniques in the preparation of Polyimide/Montmorillonite (MMT) Nanocomposites.

ABSTRACT

In this paper, Polyimide/Montmorillonite Nanocomposites (PI/MMT NCs), based on aromatic diamine (4-Aminophenyl sulfone) (APS) and aromatic dianhydride (3,3',4,4'-benzophenonetetracarboxylic dianhydride) (BTDA) were prepared using in situ polymerization and solution-dispersion techniques. The prepared PI/MMT NCs films were characterized by X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FT-IR), transmission electron microscopy (TEM) and thermogravimetric analysis (TGA). The XRD results showed that at the content of 1.0 wt % Organo Montmorillonite (OMMT) for two techniques and 3.0 wt % OMMT for the in situ polymerization technique, the OMMT was well-intercalated, exfoliated and dispersed into polyimide matrix. The OMMT agglomerated when its amount exceeded 10 wt % and 3.0 wt % for solution-dispersion and in situ polymerization techniques respectively. These results were confirmed by the TEM images of the prepared PI/MMT NCs. The TGA thermograms indicated that thermal stability of prepared PI/MMT NCs were increased with the increase of loading that, the effect is higher for the samples prepared by in situ polymerization technique.

Keyword: Polyimide; Organo Montmorillonite; Nanocomposites; In-situ polymerization; Solution-dispersion.