Nanohybrids of Polyimide and Organosilicas Containing Different Functionalized Groups

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Organic–inorganic hybrids have attracted much interest, since they usually combine desirable organic and inorganic characteristics [1]. However, the main concern here is to obtain significant improvements in the interfacial adhesion between polymer matrix and inorganic filler phases by suppressing the phase separation involved. Recently, chemical surface-modification of inorganic fine particles has been employed to improve dispersibility and compatibility in organic phase, thus providing an alternative route for preparing organic–inorganic hybrid composites.

In this study, nanohybrids of polyimide (PI) and organosilicas containing different functionalized groups were prepared using an in situ sol-gel reaction and multistep curing. PI was prepared from pyromellitic dianhydride (PMDA) and oxydiphenylenediamine (ODA) poly (amic acid). And we used triethoxy(ethyl)silane (96%), bis[3-(triethoxysilyl)propyl]amine (90%) or 1,2-bis(triethoxysilyl) ethane (96%), obtained from Aldrich, as an organosilica.

Organic/Inorganic hybrid nanocomposite films were characterized by IR spectra. The properties of PI/Organosilica nanocomposite films were characterized by dielectric constant, UV-vis spectra, dynamic mechanical analyzer, universal testing machine and thermogravimetric analyzer. Small angle X-ray scattering (SAXS) data according to the wt % of organosilica precursor are shown in Fig. 1. The SAXS data indicate that the typical broad peak of PMDA-ODA polyimide is shifted from (a) to (c), according to the formation of silica particles of less than 60 Å [2].

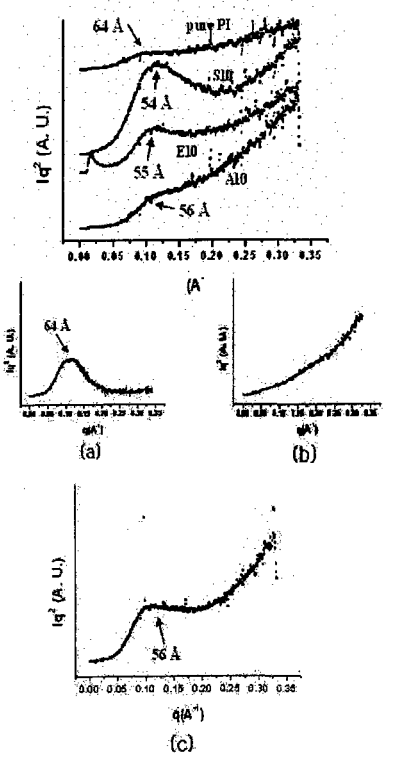

Fig. 1. The Lorentz-corrected SAXS data of the PI/organosilica nanohybrids.

References

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