

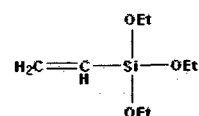
Nanohybrids from Polyimide and Organosilicas Having Different Chain Length

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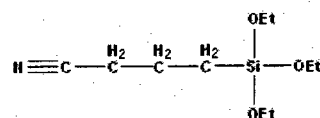
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Silica has been widely used as an inorganic component in hybrid composites to achieve various properties to meet the requirements of different applications. And polyimides (PIs) have been widely applied as matrix polymers for the advanced applications such as in the aerospace and the microelectronics industries. Increasing attention has been paid to preparing polyimide-silica hybrid composites such as organic-inorganic hybrid composite materials that comprise desirable organic and inorganic characteristics [1,2].

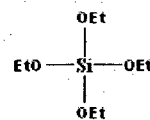
In this work, polyimide-silica hybrid composites were prepared from organosilicas having various precursors of different chain length. Polyimide was prepared from pyromellitic dianhydride (PMDA) and 4,4'-oxydianiline (ODA). Organosilicas, triethoxyvinylsilane (97%), 4-(triethoxysilyl)-butyronitrile (98%), and tetraethyl orthosilicate (98%), were obtained from Aldrich. The chemical structures of organosilica precursors having different chain length are shown in Fig. 1. Nanohybrids of polyimide and organosilicas having various precursors of different chain length were prepared using an in situ sol-gel reaction and multistep curing. The characteristics of these polyimide-silica hybrids have been studied by Small Angle X-ray Scattering (SAXS), universal testing machine (UTM), thermogravimetric analysis (TGA), dynamic mechanical analysis (DMA), IR-spectra and UV-vis spectra. It was found that the properties of the polyimide-organosilica hybrids are strongly dependent on the kinds of various precursors of different chain length.



Triethoxyvinylsilane(97%)
M.W.=190.32
d=0.911



4-(triethoxysilyl)-butyronitrile(98%)
M.W.=231.57
d=0.966



TEOS: Tetraethylorthosilicate(98%)
M.W.=208.33
d=0.933

Fig.1.Organosilica precursors having different chain length.

References

- [1] M. A. Wahab, I. Kim, C. S. Ha, *J. Polym. Sci. Part A: Polym. Chem.*, **42**, 5189 (2004).
- [2] S.W. Choi, Y. Kim, I. Kim, C.S.Ha, *J. Appl. Polym. Sci.*, to appear.

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