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PHYSICAL, MECHANICAL, MORPHOLOGICAL AND THERMAL ANALYSIS OF STYRENE-CO-GLYCIDYL METHACRYLATE / FUMED SILICA / CLAY NANOCOMPOSITES

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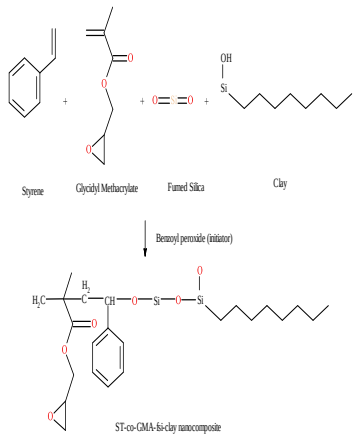
Graphical abstract



Abstract

Styrene-co-glycidyl methacrylate-fumed silica-clay (ST-co-GMA-fsi-clay) nanocomposites have been prepared via free radical polymerization in the presence of benzoyl peroxide. The nanocomposites are characterized by Fourier transform infrared spectroscopy (FT-IR), scanning electron microscopy (SEM), adsorption isotherm, tensile test, thermogravimetric analysis (TGA) and moisture absorption. FT-IR shows the Si-O-C peak that represented ST-co-GMA-fsi bonding while Si-O-Si peak shows the bonding of fsi-clay. The surface morphology shows the well dispersion of clay (1.30E) into ST-co-GMA-fsi nanocomposite. 2wt% of ST-co-GMA-fsi-clay (1.30E) nanocomposite has higher specific surface area and average pore volume with less pore size. Incorporation of 2wt% of clay (1.30E) improves the tensile strength and modulus of the nanocomposites as well as higher thermal stability and activation energy. 2wt% of ST-co-GMA-fsi-clay (1.30E) nanocomposite shows the lowest moisture absorption value.

Keywords: Adsorption, morphology, TGA, clay, nanocomposites

Abstrak

Stirena bersama glycidyl metakrilat-silika berwap-tanah liat (ST-co-GMA-fsi-tanah liat) nanokomposit telah disediakan melalui pempolimeran radikal bebas dengan kehadiran benzoyl peroksida. Nanokomposit melalui ciri-ciri jelmaan Fourier spektroskopi inframerah (FT-IR), imbasan mikroskop electron (SEM), penjerapan isoterma, ujian tegangan, analisis Termogravimetri (TGA) dan peyerapan kelembapan. FT-IR menunjukkan puncak Si-O-C yang mewakili ikatan ST-co-GMA-fsi manakala Si-O-Si puncak menunjukkan ikatan silika berwap-tanah liat. Morfologi permukaan menunjukkan penyebaran perigi tanah liat (1.30E) ke dalam ST-co-GMA-silika berwap nanokomposit. 2wt% daripada ST-co-GMA-silika berwap-tanah liat (1.30E) nanokomposit mempunyai kawasan permukaan lebih tinggi khusus and purata isi padu liang dengan kurang saiz liang. Pemerbadanan 2wt% daripada tanah liat (1.30E) meningkatkan kekuatan tegangan dan modulus dan juga kestabilan terma bersama dengang tenaga pengaktifan yang tinggi. 2wt% daripada ST-co-GMA-silika berwap-tanah liat (1.30E) nanokomposit menunjukkan nilai penyerapan kelembapan yang paling rendah.

Kata kunci: Penjerapan, morfologi, TGA, tanah liat, nanokomposit