NEW APPROACH TO THE SYNTHESIS OF EXFOLIATED POLY(STYRENE-BUTYL ACRYLATE) NANOCOMPOSITES USING FUNCTIONALIZED GRAPHENE VIA MINIEMULSION POLYMERIZATION

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ABSTRACT

Graphite is naturally abundant, and well known to be a layered material with unique and unusual properties.[1,2] It is a pseudo-two-dimensional solid with sp^2-hybridized carbon atoms arranged in a planar condensed ring system of hexagonal cells, known as graphene.[1] Graphite derivatives such as graphite oxide (GO) have been widely used as fillers for the preparation of polymer nanocomposites to improve their mechanical, thermal and electrical properties.[3,4] Although great success has been achieved in the synthesis of polymer-graphite nanocomposites using *in-situ* polymerization of the monomer in the presence of graphite nanosheets,[5,6] there are only a few reports on the preparation of these composites in emulsion systems.

Here a new method is described for the synthesis of exfoliated poly(styrene-butyl acrylate) (poly(S-BA)) nanocomposites made with modified GO using the miniemulsion polymerization technique. GO was synthesized and then modified with a reactive surfactant (surfmer), 2-acrylamido-2-methyl-1-propane sulphonic acid (AMPS), which widened the gap between the graphene layers and facilitated monomer intercalation into the GO nanogalleries. GO, of various loadings, was first mixed with AMPS and then dispersed in water by sonication. The resultant mixtures emulsified in the presence of styrene and butyl acrylate monomers, a surfactant (sodium dodecylbenzene sulfonate) and a hydrophobe (hexadecane). The stable miniemulsions were then polymerized to afford encapsulated poly(S-BA)/GO nanocomposite particles. The resultant nanocomposites had an exfoliated structure, as confirmed by X-ray diffraction (XRD) and transmission electron microscopy (TEM) measurements.

This presentation will focus on two key areas: (i) the preparation and modification of GO from natural graphite and the subsequent synthesis of exfoliated poly(S-BA)-GO nanocomposites using miniemulsion polymerization; and (ii) the characterization of the synthesized nanocomposites using various techniques, including XRD, TEM, thermogravimetric analysis (TGA) and dynamic mechanical analysis (DMA).

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