Al-MCM-41 reinforced epoxy-polybenzoxazine hybrid nanocomposites

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Polybenzoxazine (PBZ) is a highly cross-linked thermosetting resin that created a wide interest as a matrix material for the fabrication of composites. Combination of PBZ with epoxy polymer provides an excellent balance of material property and enhances the main features of the resultant polymer such as an easy thermal curing by ring opening polymerization without the need of hardeners or catalysts; a low shrinkage during curing; a high glass transition temperature with a high charring yield; a low coefficient of thermal expansion; a low moisture absorption and good chemical resistance. Hence, attempts were made in the present work that focuses on the development and fabrication of epoxy blended PBZ material and their subsequent characterization by surface analytical techniques in order to find their suitability as advanced composite materials. The composition consists of epoxy resin, benzoxazine resin and varying weight percentages (1, 3 and 5 wt%) of inorganic filler of F-Al-MCM-41. The synthesized monomer was confirmed by 1H NMR and FTIR. The final product was characterized by DMA, dielectric studies and SEM-EDAX. Thermal curing and stability of the final products were also investigated using TGA. Five wt% of epoxy-PBZ nanocomposites showed higher storage modulus and dielectric constant than the neat one indicating its possible use for capacitor applications. The interesting results obtained from the investigation are discussed with experimental evidences.

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