ENHANCED THERMAL AND MECHANICAL PROPERTIES OF POLYAMIDE 6/MESOPOROUS MCM-41 NANOCOMPOSITES FORMED BY IN SITU POLYMERIZATION

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ABSTRACT

Polyamide 6/mesoporous MCM-41 nanocomposites was synthesized by *in situ* anionic ring-opening polymerization of ε-caprolactam (CL). This reaction takes place at a fairly fast reaction rate. The polymerization was catalysed by liquid sodium methoxide and hexamethylene diisocyanate as an activator. The structural features, as well as the thermal and mechanical properties of these nanocomposites were studied by FTIR, DSC, SEM, TEM, XRD, DMA, and TGA. The thermal stability, glass transition temperatures, tensile strength and Young's modulus of the composites increase with increasing concentration of mesoporous MCM-41. The reason of such an improvement was examined and interpreted with a structural model called "interpenetrating organic–inorganic network" (IOIN). Due to the interpenetration of the organic polymer chains with the inorganic scaffold, the interfacial interaction between the surfaces of the inorganic particles and the polymer resin was improved.

***Keywords*:** Nanocomposites; MCM-41; Mechanical properties; Thermal properties