Morphological and Mechanical Analysis of Polyamide-66/Poss Nanocomposite Fiber

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Abstract

Nanocomposite fibers were prepared from poly hexamethylene adipamide (PA-66) via melt mixing of polyhedral oligomeric silsesquioxane (POSS) nanoparticles (octa-aminophenyl polyhedral oligomeric silsesquioxane (OAPS) and octaphenyl polyhedral oligomeric silsesquioxane (OPS)) into the PA-66 matrix. Analysis was then done using, fiber tensile testing, X-ray diffraction (XRD), FTIR, and field emission scanning electron microscopy (FE-SEM) to characterize the fabricated nanocomposite fibers to determine their mechanical and morphological characteristics. Tensile modulus and tenacity increased by up to 8% and 2% respectively. However, it was seen that 3% POSS loading does not give the material performance enhancements. XRD studies showed that the inter-segmental packing of the polymer chains is not disrupted by the incorporation of POSS nanoparticles. At 1%wt POSS, SEM micrographs showed a uniform cross section with no visible phase separation. As the POSS loading was increased to 3%wt, resultant nanocomposite fibre showed distinct phase separation with formation of distinctive micron size aggregates that led to reduced properties of nanocomposite fiber. OAPS at low concentrations produced nanocomposite fibers of better mechanical properties compared to OPS. OAPS at low concentrations dispersed in a polymer matrix of PA-66 has the potential to be used in nanocomposite fabrication and is recommended for further research. Keywords: Nanocomposites; Polyamide 66; polyhedral oligomeric silsesquioxane; Mechanical properties
Materials Science: An Indian Journal Vol.16 (1) pp.1-12(2018)
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