

عنوان مقاله:

Effect of Mesoporous Silica and Hydroxyapatite Nanoparticles on the Tensile Behavior of Polypropylene: Experimental Studies and Simulations

محل انتشار:

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خلاصه مقاله:

This study focuses on the effect of incorporation of two different types of nanomaterials, mesoporous silica (MCM-41), Hydroxyapatite (HA) into the polymer matrix on morphology and tensile properties of polypropylene (PP). PP/MCM-41 and PP/HA nanocomposites have been prepared by melt mixing in a twin-screw extruder. The results of tests showed that tensile strength is increased by 6.47% and 26.57% by using MCM-41 and HA nanoparticles rather than neat PP, respectively. The MCM-41 filler leads to lower tensile properties comparing to the HA nanoparticles, but the advantage of MCM-41 filler than HA particles is the porous structure and high surface area of MCM-41 particles makes voids agglomerations even at high weight percentage levels. Moreover, to investigate the tensile behavior of nanocomposites using constitutive models, applicability and best fit of three different hyperelastic models including Van der Waals, Ogden and Marlow against experimental data were studied using the commercial software ABAQUS/CAE. The performed simulations produced good results for uniaxial tensile loading. SEM observations showed that the nanomaterials were well dispersed in the polymer matrix and the enhancement of the interface between the matrix and fillers were obtained by nanoparticles.

کلمات کلیدی:

Hybrid nanocomposites, Tensile properties, Simulation, Mesoporous Silica, Hydroxyapatite

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