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HYBRID POLYMER CONTAINING IN-SITU GENERATED ALUMINUM NANOPARTICLES

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Nano-sized inorganic particles have been widely used in recent years as fillers in polymers to improve their properties. However, homogeneous dispersion of the nanoparticles in polymeric matrices is very difficult because the particles with high surface energy are easy to agglomerate. In addition, the hydrophilic nanoparticles and the hydrophobic polymers are not compatible in nature, which has to result in poor interfacial bonding. All of these deficiencies limit the effective use of inorganic nanoparticles in polymer composites. Many approaches have been proposed to overcome these difficulties, including coupling agents, grafting modification and sol-gel reactions. In the last case a nanocomposite can be formed via hydrolysis- condensation reactions of the metal alkoxides in polymeric matrix. Thus, the aim of the present work is generate aluminum nanoparticles in a polypropylene matrix using this approach.

The hybrid polymer was prepared, in the molten state, by sol-gel reactions between PP-g-MA and an aluminum alkoxide. Chemical, morphological and rheological characterization was performed.

FT IR results showed that Al-O bonds were formed as a result of chemical reaction among MA and aluminum precursor, moreover the spectrum confirm the formation of Al-OH group. This group is particular important due to its high reactivity, which provides unique properties to the hybrid polymer. The rheological behavior evidences the formation of a branched/crosslinking structure.

Morphological observations by EDX and TEM confirmed the presence of Al nanoparticles dispersed in the polymer matrix, with diameter between 200 and 100 nm.