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Processing and characterization of halloysite nanotubes filled polypropylene nanocomposites based on a masterbatch route: effect of halloysites treatment on structural and mechanical properties

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Abstract. Halloysites/polypropylene nanocomposites with different nanotubes contents were prepared by diluting a masterbatch containing 30 wt.% halloysites with polypropylene (PP). Unmodified (HNTs) and quaternary ammonium salt treated (QM-HNTs) halloysite nanotubes were used. Both degree of crystallinity and crystallization temperature increase upon addition of halloysites into PP, thus indicating a potential nucleation effect induced by the nanotubes. An homogeneous distribution and dispersion of nanotubes was observed throughout the PP matrix, with a slightly better dispersion in the case of modified QM-HNTs compared to unmodified HNTs. Mechanical tests in tension, bending and notched impact demonstrated that strength and modulus of the nanocomposites significantly increase with addition of halloysites without significant loss of ductility. An halloysite content of 6 wt.% appears as an optimum. Modified halloysites (QM-HNTs) lead to globally better performances due to strong interfacial interaction between the polymer matrix and the nanotubes.

Keywords: *nanocomposites, polypropylene, halloysite nanotubes, masterbatch*

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