POLYPROPYLENE-BASED NANOCOMPOSITE - MORPHOLOGY AND PROPERTIES

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Polypropylene nanocomposites have been extensively studied in the latter years because of their interesting properties, such as much lighter materials compared with conventional mineral fillers. Specific applications of nanocomposites materials, to improve mechanical properties or barrier properties or flame retardancy, require appropriate compositions and morphologies. The use of organically modified clay nanolayers as reinforcement element in polymer matrices has been making a splash in materials research due to the enhancement of mechanical properties as well as other properties, including high modulus, increased strength, heat resistance, among others. These properties enhancement is attributed to the large aspect ratio of the individual clay platelets that are uniformly dispersed in the polymer. Polypropylene/montmorillonite (MMT) is one of the most commonly used nanocomposites, and it is able to conjugate the relatively low cost of the filler with the improvement of the final nanocomposites properties. In this work, polypropylene/clay nanocomposites have been prepared by using a co-rotating twin-screw extruder. The results showed that the flexural modulus might increase up to 40 % and the impact resistance up to 300%. Some commercial organoclay were compared as well as the appropriated amount that should be used. The efficacy of use PP-g-MA as compatibilizer was related to the amount of quaternarium ammonium salt in the clay. The PP-g-VTES will also be used as compatibilizer. Different morphologies may be obtained depending of the processing conditions, the use of compatibilizer, and the type of organoclay. The impact resistance is related to the presence of well-distributed intercalated morphology and the flexural modulus to the orientation of the intercalated and exfoliated morphology. The role of the quaternarium ammonium salt is to keep the elongated structure of the clay, and to favor the intercalation of the polymer into the clay gallery.