NEW HDPE/MCM-41 NANOCOMPOSITES WITH IMPROVED MECHANICAL PERFORMANCE: SYNTHESIS AND CHARACTERIZATION

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Ordered mesoporous silicas with a channel structure of well-defined geometries and dimensions at nanometer scale are excellent candidates to host intercalation reactions.

In recent years, our research group has shown that mesoporous silicas of the M41S class combined with metallocene complexes give rise to excellent supported catalysts for ethylene polymerisation. Due to the support characteristics, the reaction is allowed to occur in the channels and in this way hybrid organic-inorganic materials can be prepared within a large range of nanofiller concentration. These HDPE/MCM-41 nanocomposites exhibit an improved mechanical performance and an easier degradability due to the additional role of MCM-41 as a promoter for PE degradation [1].

Aiming to improve the mechanical performance of these materials, several nanocomposites based on polyethylene at a given MCM-41 content (about 10 wt. %) were prepared, using different strategies for filler/polymer matrix modification in order to enhance the adhesion between the two components [2]. Here we report the synthesis of HDPE/MCM-41 nanocomposites through a combined strategy that involves both the preparation of controlled morphology MCM-41 nanoparticles (Figure 1), and the use of adequate dispersants/interfacial agents (ex: amphiphilic polymers or modifying agents with organophilic character) and homogenization procedures.

The mechanical performance of these materials is discussed in terms of their morphology, sample homogeneity and crystalline structure and related with the synthesis strategy adopted. Selecting adequate conditions, the formation of high dimension agglomerates of MCM-41 particles can be reduced improving the dispersion, which reflects positively in the corresponding mechanical performance of the resultant nanocomposite.

References

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