KN-3-50

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SUPERNUCLEATION VERSUS CONFINEMENT IN POLYETHYLENE/CARBON NANOTUBES NANOCOMPOSITES OBTAINED BY IN SITU POLYMERIZATION

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Nanocomposites of high density polyethylene (HDPE) and well dispersed carbon nanotubes (CNT) of different geometries (single, double and multi wall, SWNT, DWNT and MWNT) were successfully prepared by in situ polymerization of ethylene on CNT whose surface had been previously treated with a metallocene catalytic system. Self-nucleation experiments indicated that a super nucleation effect is caused by CNT on HDPE. When the crystallinity achieved during isothermal crystallization is considered as a function of CNT content, it was found that a competition between nucleation and topological confinement could account for the results. At low CNT content the crystallinity increases as a result of the nucleating effect of CNT on HDPE. However, at higher CNT content there is a dramatic reduction in crystallinity reflecting the increased confinement experienced by the HDPE chains at the interfaces which are extremely large in these nanocomposites. Another consequence of these strong interactions is the remarkable decrease in Avrami index as CNT content increases. When the Avrami index reduces to 1 or lower, a nucleation control overall crystallization process is envisaged as a consequence of confinement effects. Interesting rheological effects were also detected in blends of HDPE and the nanocomposites.