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Effect of multi-walled carbon nanotubes on the lamellae morphology of polyamide-6

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ABSTRACT

We show that crystal organization on both micro and nanoscales can be profoundly modified by dispersing carbon nanotubes (CNTs) in polyamide-6 by melt compounding. X-ray diffraction and transmission and scanning electron microscopies all indicate that when CNTs are well dispersed, crystalline spherulites are not present and remarkably crystalline lamellae grow aligning perpendicularly to the surface of the nanotubes. Such an epitaxial growth induced by CNTs during melt processing is particular to polyamide-6 because of crystallographic matching of CNTs and polyamide-6 crystal lattices. Macroscopically this epitaxial nucleation and growth can be detected and quantified by examining the splitting of the exothermic peak in calorimetric (DSC) experiments. Using optical microscopy and image analysis we show that the amount of *trans*-crystalline epitaxial crystallites increases when CNTs' dispersion quality is improved.