

Abstract Submitted
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Crystallization of Nucleator Nanofibrils in Polypropylene Melt J. LIPP, Y. COHEN, R.L. KHALFIN, Technion, Haifa, Israel, M. SHUSTER, Carmel Olefins Ltd., Haifa, Israel, A.E. TERRY, Isis Facility, RAL, UK — Self-associating molecules act as nucleating agents in polypropylene (PP) in order to increase the crystallization rate and decrease the crystallite size, by forming a fine network of nanofibrils within the polymer melt. The thermodynamic and kinetic basis for formation of this structure is not clear. Current models usually invoke a spinodal decomposition mechanism, as temperature is lowered into an immiscibility gap. This presentation deals with 1,3:2,4-Di(3,4-dimethylbenzylidene)sorbitol [dMdBS] in PP. The kinetics of structure formation was evaluated using small angle x-ray scattering, including synchrotron measurements. The results indicate a crystallization process by means of a nucleation and growth mechanism, which is controlled by the rate of homogeneous nucleation. The thermodynamic temperature of this process, determined for two different dMdBS concentrations from the temperature dependence of the crystallization half-time, agrees with that obtained by group-contribution calculation of the solubility parameters. dMdBS nanofibril formation has a remarkable effect on PP crystallization in melt-spun fibers. Just 0.4% additive at a moderate spin-draw ratio yields a crystalline morphology comprised of parallel chain-folded lamellae, with the lamellar normal highly aligned along the fiber axis.

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