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Morphological changes in polyoxymethylene on heating and cooling K. GURUSWAMY, NCL, N. SURVE, R. MATHEW, N. BULAKH, T. AJITHKUMAR, P. RAJAMOHANAN, R. RATNAGIRI, DuPont — We use modulated DSC, SAXS and solid state NMR to characterize melting, lamellar-level structure and nuclear environments respectively during heating of polyoxymethylene. Two model samples are investigated – a melt crystallized injection molded sample and a sample obtained by dilute solution crystallization. On heating the molded sample, we observe evidence for pre-melting at temperatures significantly lower than the nominal melting point, and show that this correlates with the melting of thin, imperfect lamellae inserted in-between thicker lamellae. When the temperature is increased from room temperature to around 100°C, the microstructural changes are essentially reversible on cooling to room temperature. However, on heating to temperatures above 135°C, melting of the thin lamellae results in irreversible reorganization of the semicrystalline microstructure to form thicker lamellae. In contrast to the behavior of the melt crystallized samples, the solution crystals exhibit no change in the lamellar stacking on heating to 150°C. With increase in temperature, there is amorphization at the basal surfaces of the lamellae, but the thermal motions of the amorphous chain segments remain highly constrained due to their connectivity to the lamellar surface.

K. Guruswamy
NCL

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