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Rigid Amorphous Fraction and Lamellar Structure in Nylon-6[1]
HUIPENG CHEN, PEGGY CEBE, Tufts University — A three-phase model, comprising crystalline, mobile amorphous, and rigid amorphous fractions (RAF) has been applied in the study of semicrystalline Nylon-6. The samples were Nylon-6 alpha phase prepared by subsequent annealing of a parent sample. The samples were annealed at 110°C, then briefly heated to 136°C, then re-annealed at 110°C. Temperature-modulated differential scanning calorimetry measurements allow the devitrification of the rigid amorphous fraction to be examined. We observe a lower endotherm, termed the "annealing peak" in the non-reversing heat flow after annealing. By brief heating above this endotherm and immediately quenching, the amount of RAF decrease substantially and the annealing peak disappears. The annealing peak corresponds to the point at which partial de-vitrification of the RAF occurs. None of these treatments affected the measured degree of crystallinity. Using a combined approach of thermal analysis with small angle X-ray scattering, we determine that the Homogeneous Stack Model is the correct one for Nylon-6.

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