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Rigid amorphous fraction of Nylon 11 determined from TMDSC¹

BIN MAO, PEGGY CEBE, Department of Physics and Astronomy, Tufts University — High precision, high accuracy heat capacity measurements were used to study both neat Nylon 11 and Nylon 11 nanocomposites which had been prepared by different processing procedures. The heat capacity step at the glass transition temperature was characterized from the reversing flow using temperature modulated differential scanning calorimetry, and this allows us to determine the mobile amorphous fraction. Heat fusion was obtained from endotherm area of the total heat flow curve, and was correlated with the degree of crystallinity determined from X-ray diffraction. Based on three phase model of the semicrystalline polymer structure, the rigid amorphous fraction (RAF) in Nylon 11 could be calculated. Studied Nylon 11 samples include solution cast, liquid quenched, and isothermally crystallized films, solution cast films containing multi-walled carbon nanotubes, and electrospun fibers. We observed that a rigid amorphous fraction exists in all Nylon 11 samples, and the amount of RAF is strongly dependent upon the crystalline fraction and the nanofiller content.

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