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Effect of Silicon Dioxide Nanoparticles on the Morphology and Interphase Structure of Electrospun PET Nanofibers[1] QIAN MA, BIN MAO, PEGGY CEBE, Department of Physics and Astronomy, Tufts University — Poly(ethylene terephthalate), PET, nanofibers containing silicon dioxide nanoparticles were electrospun from solutions in hexafluoro-2-propanol. Various fill fractions of silicon dioxide nanoparticles in PET were used, ranging from 0-2.0% by weight. The morphologies of both the electrospun (ES) nanofibers and the SiO2 powders were investigated by scanning and transmission electron microscopies. The phase structure of the non-woven, nanofibrous composite mats was investigated with differential scanning calorimetry and real-time wide-angle X-ray scattering. The amount of immobilized layer, the rigid amorphous fraction (RAF), was obtained based on measurement of the specific reversing heat capacity for both as-spun amorphous and isothermally crystallized PET/silica nanocomposite fibers. For the first time, existence of rigid amorphous phase in the absence of crystallinity was verified for electrospun nanocomposite fibers, and two locations of the rigid amorphous fraction are proposed. The effect of interaction between the filler and polymer matrix on the mechanical properties of single fiber is also investigated using atomic force microscopy.

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