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Properties and crystallization behavior of poly (vinylidene fluoride) (PVDF)/thermoplastic polyurethane elastomer (TPU) blends

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ABSTRACT

A series of poly (vinylidene fluoride) (PVDF)/thermoplastic polyurethane elastomer (TPU) blends were prepared with various mass ratios via melt blending. The miscibility and crystallization behavior of blends were characterized by scanning electron microscopy (SEM), attenuated total reflection Fourier transform infrared spectroscopy (ATR-FTIR), mechanical tests, wide angle X-ray diffraction (WAXD) and differential scanning calorimetry (DSC). According to cross section morphological analysis, when the content of TPU was less than 25 wt%, PVDF appeared as a continuous phase while TPU appeared as a dispersed phase. The blend was a partially miscible system. With the further increase of TPU content, the presence of distinguishable boundaries at the polymer interfaces indicated that the PVDF/TPU blends were the immiscible systems. In addition, when the TPU content reached 50 wt%, the blend system displayed the lowest mechanical properties, which was attributed to the poor miscibility of the polymer blend. On the other hand, the samples presented predominantly α phase regardless of TPU content in the blends. Compared with neat PVDF, the melting and crystallization temperature of PVDF in the blends slightly decreased. It indicated no obvious interaction between the two polymers.

Keywords: Poly (vinylidene fluoride) (PVDF); Thermoplastic polyurethane elastomer (TPU); Miscibility; Crystallization; Blends; WAXD

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