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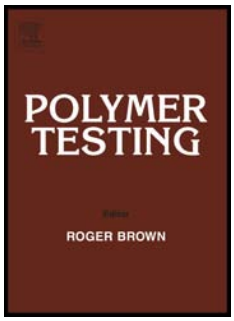

Thermal stability of P3HT and P3HT:PCBM blends in the molten state

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Material Behaviour

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Abstract

The thermal stability of poly(3-hexylthiophene) (P3HT) in its molten state was investigated in air and nitrogen atmospheres under no illumination conditions, with the aim of testing the feasibility of processing it using polymer melt techniques. A large set of different experimental characterization techniques was used including thermogravimetric analysis (TGA), rotational rheometry, infrared spectroscopy (FTIR-ATR), proton nuclear magnetic resonance spectroscopy (^{1}H-NMR), gel permeation chromatography (GPC), UV-Vis and fluorescence spectroscopy. The results obtained strongly suggest that the processing of P3HT in its molten state is possible, without noticeable degradation, if carried out under nitrogen atmosphere and if the processing (residence) times are relatively short. Conversely, as expected, in a normal air atmosphere P3HT degrades rapidly at temperatures above its melting point. The effect of PCBM on the thermal stability of P3HT:PCBM blends in the molten state was also studied using TGA, and in air atmosphere PCBM is shown to delay oxidation.