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ENVIRONMENTAL DEGRADATION OF POLY(ETHYLENE TEREPHTHALATE) BY HYDROLYSIS

MICHÈLE EDGE, MEHRDAD MOHAMMADIAN, and NORMAN ALLEN

Crystalline and amorphous poly(ethylene terephthalate) (PET) sheet have been exposed to both thermal and UV aging. Environmental breakdown has been emphasized by aging in dry and wet soils and at low and high humidities in the absence and presence of UV irradiation. Degradation has been monitored by viscometric (chain scission) and density measurements. Results indicate that hydrolysis is the dominant mode of degradation in both materials at ambient temperatures. For highly oriented PET, both chain-scission and crosslinking are evident. In the case of amorphous materials, crystallinity exhibits an initial increase due to plasticization and annealing. This is followed by rapid chain scission. Thereafter, degradation proceeds at a reduced rate with a combination of hydrolytic and oxidative mechanisms taking place. Density increases have not previously been attributed to hydrolytic annealing but have rather been considered to be due to a chemicrystallization [1] process. The two processes are presented and discussed, with evidence for hydrolytic annealing being supported with data from thermal aging under dry conditions and UV irradiation. In view of the results obtained, current physicochemical test techniques used for monitoring the environmental breakdown of PET are evaluated.

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REFERENCE

[1] A. Ballara and J. Verdu, *Polym. Degrad. Stab., 26*, 361 (1989).

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