Stability of the HPC/PU Polymeric Blends in Accelerated Weathering and Biological Environments

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Abstract: Polymeric blends of Hydroxypropyl cellulose (HPC) and Polyurethane (PU) (PU/HPC_20/80; PU/HPC_50/50; PU/HPC_80/20) have been prepared by solvent (DMF) casting method and investigated after exposure to accelerated ageing conditions by using a mercury lamp (200 < \lambda < 700 nm), at 60% humidity and 40 °C for 600 h. Their hydrolytic stability was evaluated after immersing them for 48 h in different pH (2.6 and 7.4) Phosphate-Buffered Saline (PBS) media. The structural changes in the composition of blends during the accelerated weathering and hydrolysis processes have been investigated by means of FT-IR (Fourier Transform Infrared) spectroscopy and DSC (Differential Scanning Calorimetry) analysis. FT-IR spectra of the blends after 600 h of irradiation and 48 h hydrolysis in PBS solutions revealed a major degradation process especially in the HPC component and in the soft segment of PU. The changes in the crystallinity of the blends have been also evaluated by FT-IR (by determination of Total Crystallinity Index (TCI) and Lateral Order Index (LOI)) and DSC that evidenced the reduction of the melting enthalpy (\Delta H_m) and of its corresponding crystallization (Tc) on heating/cooling runs indicated that ageing strongly affects the crystallinity of the PU/HPC blends.

Keywords: accelerated wheatering; hydroxypropyl cellulose; polyurethane; blends; biological media; DSC; FTIR.

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