AGING CHARACTERIZATION OF COMMERCIAL ETHYLENE COPOLYMER GREENHOUSE FILMS BY ANALYTICAL AND MECHANICAL METHODS

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Abstract

This paper focuses on the description of the aging behavior of ethylene(vinylacetate) (EVA) greenhouse films due to accelerated weathering. Two commercially available multi-layer films were chosen as model materials. The degradation behavior was analyzed by infrared spectroscopy (IR) in transmittance and attenuated total reflectance (ATR)-mode, by UV/VIS/NIR-spectroscopy, differential scanning calorimetry (DSC) and by comprehensive mechanical characterization. Using IR spectroscopy hydroxyl, vinylidene and acid groups were identified as main degradation products. By IR and UV/VIS/NIR-spectroscopy the consumption of stabilizers was detected. Post crystallization was detected by DSC measurements. The analytical results of the weathered films were correlated to ultimate mechanical properties determined by investigating unnotched and notched specimens. The results suggest that degradation of the investigated polymer films is strongly confined to the surface. While both films were of different layer structure, in contrast to the 30 µm thick film, the aging processes on the surface of the 200 µm thick films are not reflected by mechanical properties. Nevertheless, tensile tests appeared to be the most versatile method for describing aging phenomena. Both chemical aging and physical aging as well as local (initial) and global aging effects are reflected by mechanical properties.