Ultraviolet-induced degradation of Ziegler-Natta and metallocene catalyzed polyethylenes.
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Abstract

The metallocene revolution has aroused a storm of interest and assocd. questions regarding the performance and durability of polyolefins. This new technol. has impacted the additives used to stabilize and process polymers. In this work, Ziegler-Natta and metallocene polyethylene (PE) samples were exposed to natural weather conditions under high doses of UV radiation, high temp., and increased humidity. Weather-induced degrdn. of the two sets of PEs was studied using gel permeation chromatog., mech. properties testing, differential scanning calorimetry, and Fourier transform IR spectroscopy. The gel permeation chromatog. anal. indicated the change in mol. wt. distribution and mol. wts. of metallocene PE to be more stable than conventional Ziegler-Natta PE. The tensile properties of metallocene PE are known to have higher values than Ziegler-Natta PE. The former exhibited a lower drop rate in mech. properties when exposed to natural weather. Formations of nonvolatile carbonyl oxidn. products, which absorb in the IR region with a max. absorbance level at 1742 cm-1 were detd. This indicated a higher rate of photo-oxidative and thermal degrdn. of Ziegler-Natta PE as compared with metallocene PE. The UV stabilization of metallocene PE may require different doses and a new kind of stabilizer system that can impart a longer useful lifetime and are cost effective for PE used for outdoor purposes.