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Natural Aging in HMS-PP for One Year

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High melt strength polypropylene (HMS-PP) grades are produced by radiation process and have improved rheology for melt blow process. The melt strength (MS) properties of a polymer increase with molecular weight and with long chain branching due to the increase in the entanglement level. The main scope of this study is to evaluate the stability of HMS-PP prepared by gamma radiation with doses of 5; 12.5 and 20 kGy in comparison with virgin PP.

The samples submitted to the natural aging for a period of one year were characterized by: thermogravimetry analysis (TGA), differential scanning calorimetry (DSC), infrared spectroscopy (FTIR) and scanning electronic microscopy (SEM).

The chemi-crystallization caused by a variety of degradation processes (photodegradation) was detected in HMSPP. The consequence of chemi-crystallization is the formation of surface cracks caused by contraction of the surface layers. The SEM analysis showed particular aspects of fractures in the surface.

The results showed that HMSPP samples is exposed to UV radiation, oxidation reactions occur, resulting in chain scissions. The reactions occur preferentially in the amorphous phase owing to the higher permeability of oxygen.

Keywords: polypropylene, gamma radiation and chain scissions

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