Thermooxidative Degradation of High Melt Strength Polypropylene (HMS-PP)

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ABSTRACT

Modified properties of polyolefins, including iPP, must find an explanation in terms of the basic irradiation processes: crosslinking , branching and degradation.

HMS-PP in pellets form was synthesized by the gamma irradiation (^{60}Co) of PP under a crosslinking atmosphere of acetylene with doses of 5, 12.5 and 20 kGy. After irradiation the samples were submitted to a thermal treatment at 90 °C for 1h to eliminate residual radicals [1,2]. A common approach for characterizing ageing response in a more practical time frame is to conduct accelerated ageing tests at temperature above the expected service limits. The thermal stability of the HMS-PP was evaluated after thermal ageing of dumbbell samples using a stove at temperature of 120 °C, in presence of air at different periods of time. The surface of PP , pristine and modified, (i.e., irradiated), was studied using optical microscopy (OM), scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR) and X ray scattering.

The effects of elevated temperature ageing were evaluated in HMS-PPs exposed surfaces according to the order: HMS-PP 20 >12.5 >5 kGy, showing intense crack formation in all the exposed surfaces due to thermooxidative degradation.

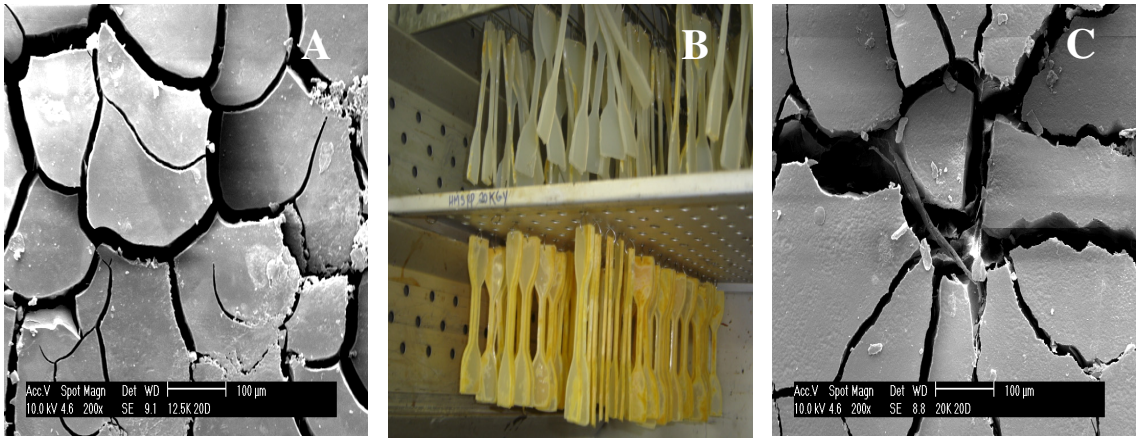

Figure 1 -: (A) Scanning Electron Microscopy (SEM), HMS-PP 12.5 kGy , 100 µm, (B) Dumbbell samples degradation in Stove, (C) SEM, HMS-PP 20 kGy, 100 µm.

The results were compared with previous work [1] where no evidence of thermoxidation was reached, exposition applied test at temperature of 90°C. The new condition is more conclusive about the effect of the thermooxidative degradation in the irradiated materials.

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