Degradation process of polypropylene due to high energy radiation.

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High energy radiation like as electron beams from electron accelerators or gamma rays from Cobalt-60 sources has been used to achieve polymers with special characteristic. Lately, the polymer radiation process is growing due to the improvement and understanding of the radiation chemistry underlying radiation polymerization, scission and crosslinking from several works. The main effect resulting in this process is strongly dependent on the molecular structure of the polymer and the irradiation conditions.

In the case of isotactic polypropylene the degradation process by chain scission under inert atmosphere due to ionized radicals formed is well established. On the other hand, the use of monomers or crosslinking agents can reduce this process and chain branching followed by crosslinking have been observed. The aim of this work is the polypropylene degradation study due to gamma irradiation under inert conditions. For this purpose an isotactic polypropylene with high molecular weight without antioxidant was irradiated with doses ranging from 0 to 100 kGy.

It was observed at low doses such as 5 and 12.5 kGy an increase in the degradation process by the complex viscosity, elastic modulus and melt flow index behaviors. The case of higher doses it has been found an opposite behavior due to crosslink formation that was confirmed by the gel fraction evaluation (insoluble chains).

One possible way to understand and follow the polymer degradation can be done by the analysis of the chain scission distribution function, the CSDF curves. This function allows the calculation of the average number of chains that has been submitted to the process of scission as a function of their initial molecular weight. From the curves it is possible to obtain information about the scission rate for each irradiation dose. The curve of the number of chain scissions and CSDF curves are calculated from the molecular weight distribution (MWD) curves exported as ASCII files from the gel permeation chromatography (GPC) to Excel macro software, called *CSDF4.1 Program*, running on a computer. GPC for all samples have been obtained thus like CSDF curves. The irradiation degradation process of polypropylene may be visualized when CSDF curves are correlated with MFI values. Finally, degradation process was more evident in polypropylene irradiated at low doses of gamma rays.