

Ionizing radiation effect on density of crosslinking of recycled polyamide-6

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Successive recycling cycles promote changes in several material properties, like breaks of structures, decrease of molecular weight, increase of melt index and decrease of mechanical resistance. These changes depend on the kind of recycled plastic resin, how and how long the recycle process takes, specially the temperature and shearing strain applied^[1].

The interaction of the ionizing radiation with polymers results in energy transfer to them. This phenomenon may cause permanent modifications in the polymer's physical chemistry structure. The induced modifications may result in degradation of the polymer or in improvement of its properties (crosslinking), which are simultaneous and competing processes, depending on the radiation dose utilized.

The polyamide-6 test specimens, virgin and recycled, were irradiated at the Nuclear Energetic Research Institute (IPEN) radiation facility, on a JOB 188 model accelerator, with 1.5 MeV electron beam, with doses of 50, 100, 200, 300 and 500 kGy, with dose rate of 22.61 kGy/s. It was observed that crosslinking occurred in the irradiated samples of recycled polyamide-6.

The aim of this work is to study the ionizing radiation effects on density of crosslinking of recycled polyamide-6 at 25°C and molecular weight between crosslinking (M_c) according to Flory-Rehner^[1].

[1] P.J. Flory and R. Rehner, Jr., J. Chem. Phys., 11, 512 (1943).