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Effects of γ irradiation on polyethylene isophthalate

Radiation methods are largely used for polymerisation and polymer modification [1, 2], since irradiation induces changes in the structure of materials which can be exploited to obtain new features or to improve their performance. On the other hand, degradation of the polymer properties is observed under the combined action of ionising radiation and oxygen [3]; chain scissions and cross links are often induced [4, 5] and the presence of new functional groups such as carbonyls, carboxyls, esters, hydroxyls and unsaturation is observed. Correspondingly, worsening of properties such as mechanical strength, electrical insulation power and water repellence may be registered. Therefore, the change of the chemical and physical properties of polymers under irradiation is an interesting field of research in view of future applications.

In this work we discuss data on the changes of the physical properties of a polyester, polyethylene isophthalate (PEI), subjected to gamma irradiation. It is a semicrystalline polymer with a structure similar to polyethylene terephthalate; in particular, the presence of an aromatic ring [6] makes this polymer a good candidate to withstand to radiation effects. We studied the effects of gamma irradiation on PEI for doses up to 1 MGy by means of viscosity and differential scanning calorimetry measurements, which allow to express changes in the structure in terms of variations in the molecular weight, as well as a percentage crystallinity dependent on the dose. Furthermore, positron annihilation lifetime spectroscopy supplied us information on the free volume present in the amorphous phase of the irradiated polymer.

References

- [1] Wood RJ, Pikaev AK. Applied radiation chemistry radiation processing. New York: Wiley; 1994.
- [2] Dongyuan L, Lianshui Z, Yaqi W, Wenxiu C. J Radiat Phys Chem 1987;29:175.
- [3] Jellinek HHG. Aspects of degradation and stabilization of polymers. Amsterdam: Elsevier; 1978.
- [4] Babic D, Stannett VT. J Radiat Phys Chem 1987;30:183.
- [5] Survey S. J Radiat Phys Chem 1999;56:375.
- [6] Campbell F. J Radiat Phys Chem 1981;25:389.

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