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Polymer Science U.S.S.R. Vol. 28, No. 3, pp. 741-746, 1986
Printed in Poland

0032-3950/86 $10.00+.00


# METHODS OF INVESTIGATION

# NMR DETERMINATION OF DAMAGED LAYER THICKNESS IN THE $\gamma$-IRRADIATED POLYETHYLENE*

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(*Received* 6 *June* 1985)

The thickness of the degraded surface layer in $\gamma$-irradiated low density polyethylene (LDPE) and the total dose have been determined. This was done either by NMR measurements or by measuring self-diffusion coefficients of the macromolecules (by a pulsed NMR method) in the surface layer and in the LDPE sample as a whole.

IT IS KNOWN [1] that the irradiation of PE in air leads to the appearance of a waxlike layer on the surface, differing in its mechanical properties, and providing a site where localized radiation-oxidative degradation processes take place. The thickness of the surface layer is determined by the crystallinity of the polymer, and by the irradiation conditions, in particular, by the temperature of the environment, the oxygen pressure and the irradiation intensity. To determine the durability of the PE under the irradiation conditions it is necessary to have data on the degree of penetration of radiation-oxidative processes taking place in the material, since it is the ratio of degraded/intact portions of the polymer which will determine its reliability as a whole.

One method that may be used to determine the degraded layer thickness involves successive removal of layers from the surface of the irradiated material, and then measuring for each layer some parameter which reacts to changes in polymer properties under the action of irradiation. For instance, the parameter used in this connection in [2] was the coefficient of self-diffusion of macromolecules in a PE melt. However, the work of removing layers from the samples is very time-consuming.

* Vysokomol. soyed. **A28**: No. 3, 663–667, 1986.