THERMAL RESISTANCE OF EPDM/IIR SYSTEMS UNDER γ-IRRADIATION

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The application areas of butyl rubber concern the tire production in automotive industry, gaskets and membranes for chemical engineering, commodities and toys destined to daily life. The blending of IIR rubbers with various elastomers brings about useful alternatives to neat materials.The evaluation of the degradation behavior allows the selection of proper systems, which are the most resistant to accelerated ageing.

Three IIR loadings (5, 10 and 20 phr) of EPDM were brought into consideration for different butyl rubber structures: pristine, chlorinated and brominated IIR. For advanced degradation γ-irradiation was applied at dose rate of 0.4 kGy.h^{-1} over a large dose range (up to 300 kGy). The stability investigations by FTIR and chemiluminescence (isothermal and nonisothermal procedures) were accomplished on thin films (thicknesses 100 μm).

The presence of halogenated IIR influences the thermal and radiation stabilities of there compounded systems[1]. The sequence in oxidation resistance reveals the influence of halogen atoms, because of their different electronegativity: EPDM-IIR neat > EPDM-IIR Br > EPDM-IIR Cl > EPDM neat.

The exposure of EPDM/IIR samples to γ-irradiation induces progressive oxidative degradation. The evolution of calculated carbonyl and hydroxyl indexes depicts the unlike behavior in respect with the scission process. The most stable is EPDM/neat IIR blend, which has the lowest sensitivity on radiochemical degradation.

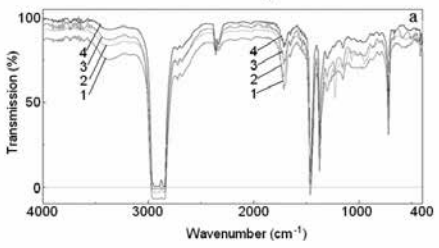

Fig. 1. FTIR spectra recorded on EPDM/IIR (5 phr) blends γ-irradiated at 220 kGy.

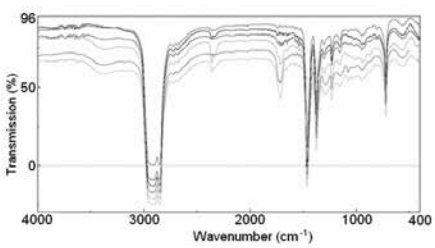

Fig. 2. FTIR spectra recorded on EPDM/IIR-Br (10 phr) at various doses
(-) 0 kGy; (-) 40 kGy; (-) 100 kGy; (-) 180 kGy; (-) 280 kGy; (-) 300 kGy.

The present work demonstrates the negative influence of halogen substitution on the radiation stability, when modified IIR is processed. The most important feature of EPDM/neat IIR is the higher radiochemical strength, which recommends it as a suitable resistant material. However, the compounding of ethylene-propylene terpolymer with butyl rubber can be considered as a product with improved stability against oxidative ageing.

REFERENCES

1) T. Zaharescu, M. Giurginca, S. Jipa, Polym. Degrad. Stab. 63 (1999) 245.