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Supplementary material

Evaluation of γ-Irradiation Effects on EPDM/SBS Blends for Durability and Recycling Potential

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S1. The Composition and Codification of Analyzed Samples

The samples were prepared by the melt blending technique using an electrically heated laboratory roller mill machine, model ZG-160YRDB (from Xiamen Ollital Technology Co Ltd, Xiamen, China). The working parameters were: friction ratio 1:1.2, temperature 95-115°C, and blending time 10 minutes for each formulation.

The sample compositions are listed in Table 1.

Table S1. Formulation of the blends.

Components	Blending percentage (wt%)				
	S100	**E25S75**	**E50S50**	**E75S25**	**E100**
EPDM	-	25	50	75	100
SBS	100	75	50	25	-
TPTMA	3	3	3	3	3

S2. Chemiluminescence Study—Activation Energy Calculation

The activation energies required for the oxidation of the studied samples were calculated by the Arrhenius procedure [1] using equation (1).

$$\text{tg } \alpha = -E_a/R \quad \text{(S1)}$$

where tg α is the slope of ln vs reciprocal temperature, Ea is the value of activation energy (kJ mol^{-1}), R is the ideal gas constant (8.314 J K^{-1}mol^{-1}).

S3. Volume Fraction of Rubber

V_r is the volume fraction of rubber in swollen mass calculated with the equation (2).

$$V_r = \frac{\text{volume of rubber}}{(\text{volume of rubber})+(\text{volume of solvent})} = \frac{\frac{m_d}{\rho_r}}{\frac{m_d}{\rho_r}+\frac{m_s-m_d}{\rho_s}} \quad \text{(S2)}$$

where: ρ_s - density solvent (0.866 g/cm^3 for toluene), ρ_r - densities of the dry rubber sample, and m_s-m_d = weight of solvent in the swollen rubber [2]. The density of elastomer samples was measured according to ISO 2781.

For our evaluation of crosslinking densities we ascribe the values of 0.496 for the interaction parameter EPDM/toluene [3] and 0.570 for the interaction parameter SBS/toluene [2]. For the blends the weighted average of the polymer/solvent interaction parameter (χ_{12}): for E25S75: 0,551, for S50E50: 0,533 and for E75S25: 0.514.

References

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