Crosslinking and Grafting the EPDM Rubber by Means of Accelerated Electrons in the Presence of Polyfunctional Monomers

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This work presents how the ethylene-propylene-diene terpolymer elastomer (EPDM) was crosslinked by means of accelerated electrons in the presence of some polyfunctional monomers: trisallyoxy-triazine (TAC), ethandiol dimethacrylate (EDMA), zinc diacrylate (ZDA). Polyfunctional monomers can act as sensitizers in irradiation induced crosslinking, thus enabling the irradiation dose required for crosslinking to be reduced. At the same time, by grafting these onto the EPDM polymer chain some characteristics are improved.

Three parts of polyfunctional monomers (TAC, EDMA, ZDA) to 100 parts rubber were used. Irradiation was conducted at 5, 10., 15 and 20 Mrad, respectively. The obtained results have revealed that the irradiation of EPDM with 5 Mrad have resulted in an abrupt increase in elasticity, breaking strength, elongation at break and tear strength, revealing that the elastomer turns from the plastic condition to an elastic one. Elongation set (revealing the elastomer reset after the elongation) have shown high values, thus revealing a deficient elastomer crosslinking. When the irradiation dose was increased up to 10, 15 and 20 Mrad an increase in the hardness, elasticity and elastic modulus, and a decrease in elongation at break and elongation set have occurred, revealing an increased EPDM elastomer cosslinking. In all the cases the best irradiation dose was within the 15 - 20 Mrad range. When using TAC the best dose was of 15 Mrad; at 20 Mrad a decrease in elastic modulus, hardness and tear strength and an increase in elongation at break and elongation set have occurred, revealing an increase in the irradiation causing the damage against those causing crosslinking and grafting.

The introduction of polyfuntional monomers has revealed an improvement in the physical-mechanical characteristics, the best results being obtained when using ZDA.

From the performed investigations it can be concluded that, when comparing with the results obtained by crosslinking the EPDM by thermal process with peroxides, the EPDM crosslinking with EA has led to higher physical-mechanical characteristics and, additionally, the curing agents are removed, and the power expenditure and crosslinking time are reduced.