Tuesday, November 8, 2016 - 15:30 to 17:30
Poster Session: Various Topics - Other Materials

Effect of gamma radiation on crosslinking of butyl rubber compounds

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Butyl rubbers when are subjected to high energy radiation the forms free radicals that initiate various chemical reactions. These reactions alter the molecular distribution of these rubbers by crosslinking or scission affecting their physical and mechanical properties. The aim of this work is the analysis of the effect induced by g-irradiation on the crosslinking density in butyl rubbers (pristine or modified by chlorination and bromination) by swelling measurements accomplished before and after irradiation at 0 kGy, 5 kGy, 25 kGy 50 kGy, 100 kGy and 200 kGy doses, allowing the evaluation of cross-linking density according with Flory-Rehner equation. Rheometric tests were also carried out to complete the characterization of radiation effects in this rubber structures. Both types of investigations describe the crosslinking degree relative to unprocessed materials. It can be noticed that the modification in material structure by the formation of new three-dimensional network changes the features of studied rubbers. This assessment was confirmed by swelling measurements on all g-exposed butyl rubbers at various doses. The estimation of crosslinking density by Flory-Rehner equation is a proper procedure for the qualification of radiation resistance. The level of cross linker (sulfur, resin or donor sulfur) in the butyl rubber formulation plays also important role in the degradation process. The predominance of chain scission can also be remarked in butyl rubber. The change in crosslinking density of butyl rubber compounds emphasizes that the mechanism of degradation is strongly influenced mainly by irradiation dose for doses above 50 kGy, since the process of chain scission predominates over the crosslinking reaction.