HiLARIS
Astrophysics & Aerospace Technology
ISSN: 2329-6542
2020
Vol.8 No.2

Effect of Gamma Radiation on the Mechanical and Degradation Properties of Bromobutyl Rubber Compounds

Sandra R, Scagliusi[1], Elizabeth Carvalho Leite Cardoso[1], Ademar Benevolo Lugã[1]

[1] Instituto de Pesquisas Energéticas e Nucleares-IPEN- São Paulo/SP- Brazil

Abstract

Bromobutyl rubber (BIIR) is an isobutylene/isoprene copolymer, containing 1.9% to 2.1% bromine content. Halogenated butyl rubbers have their major applications in tires without inner tubes, various types of seals, membranes, hoses for chemical products conveying and stoppers for pharmaceutical uses. When butyl rubbers are subjected to high-energy radiation, they form easy free radicals that initiate various chemical reactions. These reactions alter the molecular distribution of irradiated rubbers by crosslinking or scission affecting their physical and mechanical properties. The aim of this work is the analysis of effect induced by gamma exposure on the crosslinking density in butyl rubbers (pristine or modified IIR by chlorination and bromination) by swelling measurements accomplished before and after irradiation at 5, 25, 50, 100, 150 and 200 kGy allowing the evaluation of crosslinking density according with Flory-Rehner equation. Rheometric tests were also carried out to complete the characterization of radiation effects in this rubber structures. 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 evolution was confirmed by swelling measurements on all -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 decrease in the damaging rate is properly described by the modification in crosslink number. However, the consistency of results indicates the predominance of chain scission in gamma processed butyl rubbers. 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.

Biography:

Sandra Regina Scagliusi has completed his PhD at the age of 8 years from Nuclear Research Institute and postdoctoral from Nuclear Research Institute. She is a teacher in Production Engineering and Electronic Engineering courses. He works mainly on the following topics: irradiation, recycling, devulcanization, microwaves. Developed a new process for the recovery of rubbers by radiation and mechanical shear. She has been dedicated to research in the environmental area, in recycling solid materials and elastomers, has more than 15 articles published. Proven experience in research and quality control laboratories.

EuroSciCon Conference on Advanced Nanotechnology; February 21-22, 2020; Amsterdam, Netherlands

Abstract Citation: Sandra R, Scagliusi, *Effect of Gamma Radiation on the Mechanical and Degradation Properties of Bromobutyl Rubber Compounds*, Advanced Nanotechnology 2020, EuroSciCon Conference on Advanced Nanotechnology; February 21-22, 2020; Amsterdam, Netherlands