Radiation degrading effects on butyl rubber compounds properties

Sandra R. Scagliusi
IPEN/CNEN, Brazil

The understanding of Chemistry involved in degradation induced radiation is becoming more and more relevant in re-use of polymerical materials, as well in beneficial radiation uses. Degrading radiation effects have been considered from viewpoint of controlled degradation for isoprene/isobutene in rubbers for recycling purposes. Butyl rubber (IIR) is an isobutylene/isoprene copolymer, with a lot of applications even in tires air-chambers. When butyl rubbers are subjected to high energy radiation, they build easy free radicals that initiate various chemical reactions. These reactions alter molecular distribution of irradiated rubbers by crosslinking or chain-scission, both affecting their physical and mechanical properties. This work aims to analyses of effect induced by exposure on crosslinking density in butyl rubbers by swelling measurements accomplished before and after irradiation at 25, 50, 100 and 200 kGy, with further evaluation of crosslinking density accomplished by Flory-Rehner equation. In summary, this is a proper procedure for the qualification of radiation resistance. It can be noticed that changes in material structure is due to build-up of new three-dimensional network in rubbers. Changes in crosslinking density of butyl rubber compounds emphasize that degradation mechanism is strongly influenced by higher doses of gamma-radiation.