

Polybutadiene and Styrene-Butadiene rubbers for high-dose dosimetry

Lucas N. Oliveira^{1,2*}, Sílvia L. Vieira³, Fernando Schmidt⁴,
Patrícia L. Antonio², Linda V.E. Caldas²

¹*Instituto Federal de Educação, Ciência e Tecnologia de Goiás-IFG, Campus Goiânia, Goiânia -GO, Brasil*

²*Instituto de Pesquisas Energéticas e Nucleares -IPEN, São Paulo-SP, Brasil*

³*Instituto de Física, Universidade Federal de Goiás-UFG, Campus Samambaia, Goiânia-GO, Brasil*

⁴*Instituto Federal de Educação, Ciência e Tecnologia de Goiás-IFG, Campus Inhumas, Inhumas-GO, Brasil*

*lucas@ifg.edu.br**

Polybutadiene and Styrene-Butadiene are synthetical rubbers used widely for pneumatic tires manufacturing. In this research, the dosimeter characteristics of those rubbers were studied for application in high-dose dosimetry. The rubber samples were irradiated with doses of 10 Gy up to 10 kGy, using a ⁶⁰Co Gamma Cell-220 system (dose rate of 1.089 kGy/h) and their readings were taken on a Fourier Transform Infrared Spectroscopy-FTIR system (model Frontier/Perkin Elmer). The ratios of two absorbance peaks were taken for each kind of rubber spectrum, Polybutadiene (1306/1130 cm⁻¹) and Styrene-Butadiene (1449/1306 cm⁻¹). The ratio calculated was used as the response to the irradiation, and is not uniform across the sample. From the results, it can be concluded for both rubbers: a) the dose-response curves may be useful for high-dose dosimetry (greater than 250 Gy) (Fig.1); b) their response for reproducibility presented standard deviations lower than 2.5%; c) the relative sensitivity was higher for Styrene-Butadiene (1.86 kGy⁻¹) than for Polybutadiene (1.81 kGy⁻¹), d) for doses of 10 kGy to 200 kGy, there were not variation in the dosimetric response. Both types of rubber samples showed usefulness as irradiation indicators and as high-dose dosimeters.

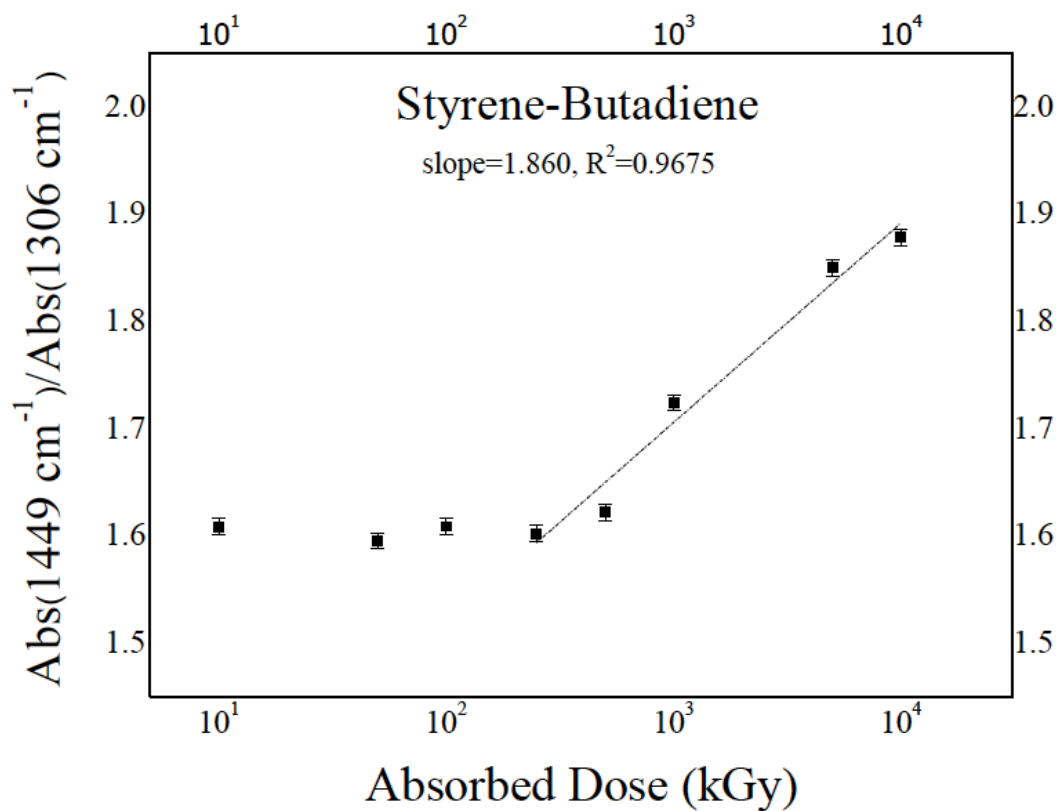
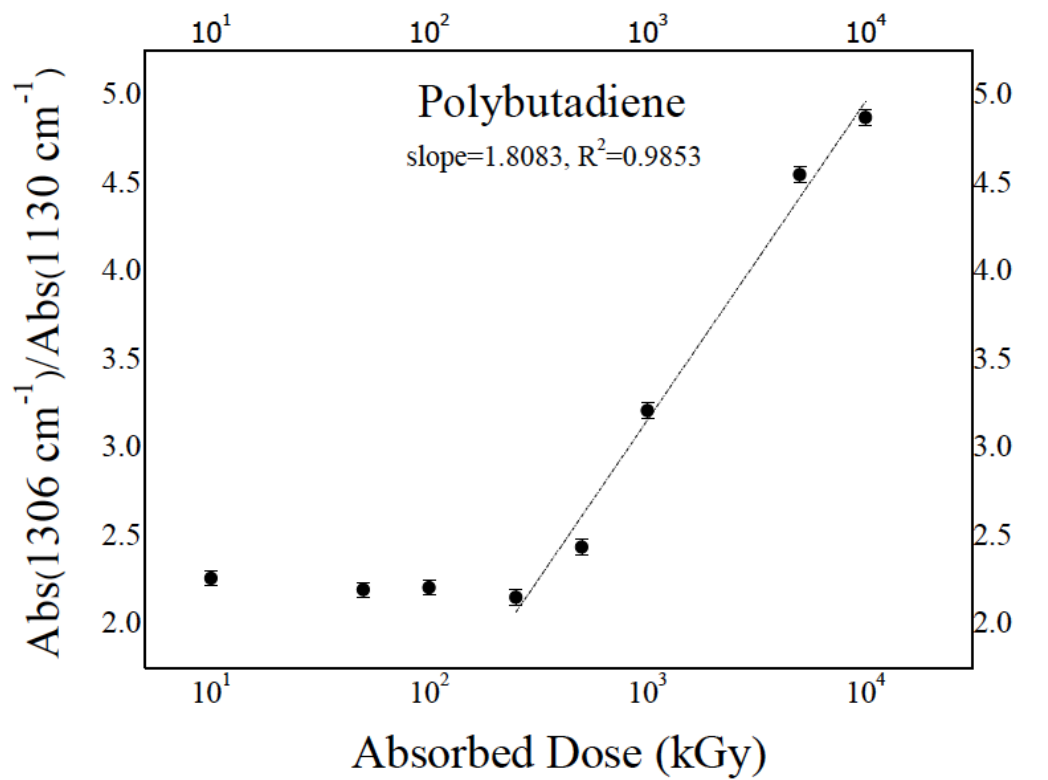


Figure 1. Dose-reponse curves of Polybutadiene and Styrene-Butadiene at Gamma doses of 10 Gy to 10 kGy.