Evaluation of $BaSO_4$ Samples Doped with Different Concentrations of Dy by the Optically Stimulated Luminescence Technique

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During the last decades, a sensitive grow in the utilization of optically stimulated luminescence (OSL) in the field of radiation dosimetry has been observed. This is justified by the fact that the OSL method presents some advantages in relation to the thermoluminescence technique (TL). The main advantages are related to the possibilility of reanalysis of the dosimeter data, high sensitivity and environmental stability. In this work, samples of $BaSO_4$:Dy crystals with different Dy concentrations were tested utilizing the OSL technique. The concentrations evaluated were: 0.05%, 0.1%, 0.2% and 1.0%. The OSL characteristics of all samples were analyzed to verify the sample with the best OSL signal. The samples were synthesized by the chemical co-precipitation method. The sintered pellets of $BaSO_4$:Dy were prepared, using Teflon as binder, and the parts were mixed in the ratio 2 (Teflon):1(powdered sample) in nitrogen open atmosphere, to facilitate its handling. This mixture was cooled with liquid nitrogen to optimize the homogenization. These pellets are 6 mm in diameter by 2 mm in thickness, and they present 50 mg of mass. The samples were irradiated using a Gamma Cell-220 System of ^{60}Co (dose rate of 1.258 kGy/h), at ambient temperature. The OSL measurements were taken using a RISÖ TL/OSL Reader and Controller, model DA-20, and the data acquisition was realized using a personal computer. The main dosimetric properties of the $BaSO_4$:Dy samples studied in this work were: dose-response curves to gamma radiation (^{60}Co), reproducibility of the response, lower detection limits and thermal fading. According to the results obtained, all $BaSO_4$:Dy samples are suitable for dosimetric procedures for high doses using the OSL technique.

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