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Investigation of Optically Stimulated Luminescence of Alexandrite Pellets for Applications in the Dosimetry

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Alexandrite $(\mathrm{BeAl_2O_4 : Cr^{3+}})$ is a mineral of the chrysoberyl species found in abundance in Brazil. It is expected to have potential as a natural dosimeter for ionizing radiation since its composition contains 19.8 wt % BeO and 80.2 wt % $\mathrm{Al_2O_3}$, both oxides being commercially used as dosimeters. Previous analyzes have shown that this material has excellent dosimetric characteristics verified by thermoluminescence (TL) and optically stimulated luminescence (OSL) response. Alexandrite-polymer (mass ratio of 1:1) pellets, disc-shaped, homogenous and ductile were evaluated using OSL technique. OSL is the process by which a previously irradiated material emits light when illuminated. The OSL measurements were performed using a Risø equipment ($^{90}\mathrm{Sr}/^{90}\mathrm{Y}$ beta source). OSL emission was stimulated using blue light emitting diodes (470 nm, FWHM = 20 nm) delivering 80 mW/cm^2 at the sample position in CW mode. The characteristics studied were dose - response (0.1 up to 5 Gy), reproducibility and fading. The results showed that the OSL intensity signal varies linearly with the dose, a fast fading of 40% in the first half hour of storage, but with the signal remaining constant for at least five hours more. The reproducibility results showed a variation smaller than 5%, within the 95% confidence interval. Results obtained with these pellets showed sensitivity in a large range of doses. In addition, it was also noted that the shape of the OSL decay curve was independent of the radiation dose, an important feature for an OSL dosimetric material. These results show that pellets have a promising future as dosimeters.