Amazonite-teflon composites as TL radiation detectors

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The potassium-rich feldspars have been utilized in dating of ceramic sediments [1]. However, these minerals present an anomalous fading of thermoluminescent (TL) signal; the TL emission at 400 nm increased with the absorbed dose of radiation, and its TL response became stable after 45 days of storage [2]. Therefore, it is possible to make use of feldspars for radiation dosimetry after a previous dosimetric study of the samples. Amazonite is a green colored variety of microcline-feldspars ($KAlSi_3O_8$) and hardness of 6. Its TL emission presents peaks overlapped in the temperature range between 70 and 300^{o}C. In this work the possibility of utilization of composites of Brazilian natural amazonite as a dosimeter for X and gamma radiation was studied after the separation of TL peaks. For the analyses, composites of 50 mg were produced of a mix of Brazilian amazonite powder of grains between 0.045 and 0.65 nm and Teflon in the ratio of a 1:1 (wt) and then pressed, producing pellets of size of 6mm in diameter and 1mm in thickness. The TL measurements were performed 24 hours after the irradiations, by using a Harshaw 3500 equipment, that operates from 50 to 300^{o}C following a linear heating programme with a heating rate of 5^{o}C/s. The irradiations of the samples with X rays were performed in air, at 50cm of the focus of the X ray tube, with energies between 27,15 and 40,75 keV. The irradiations with gamma rays were done at a distance of 1 m from the ^{137}Cs and ^{60}Co sources. The TL emission glow curves of amazonite-Teflon composites showed a TL peak at 120^{o}C and a broad emission after the first TL peak. The broad emission was analyzed as two TL peaks with maximum TL intensities at 180^{o}C and 225^{o}C. In the reproducibility tests, the TL emission of the composites did not change after 10 successive thermal treatments, irradiation e reading procedures. The calibration curves presented linearity between 0.5Gy and 10.0Gy in all energies for the two first peaks. The fading of the TL peaks was studied. The results obtained indicate that the composites of amazonite-Teflon present usefulness for ionizing radiation dosimetry.

References

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