

TSEE studies of jade-teflon dosimetric pellets

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The technique of thermally stimulated exoelectron emission (TSEE) is attractive, due to its potentiality of applications in radiation dosimetry using solid systems. The technique can be applied for personal dosimetry, environmental monitoring, ultra sound dosimetry, study of material properties, in the geology (activity of earthquakes), in medicine and in diffusion studies in solid surfaces. In the literature, almost all papers about Jade discuss only their aspects from the point of view of crystallography or thermodynamics, using synthetic samples, in comparison with natural samples [1]. The dosimetric properties of Jade were already studied using the thermoluminescent technique, showing its potential use for high-dose dosimetry [2]. In this work pellets of Jade-Teflon composites originary from New Zealand, Austria, USA and Brazil were studied in relation to some TSEE dosimetric characteristics: repeatability, emission curves, calibration curves, minimum detection limits, and energy dependence (gamma radiation). The samples were cleaned and then powdered, and only the grains with diameters between 0.075 and 0.149 mm were utilized in this work to produce thin sintered pellets of Jade-Teflon composites (5.5mm in diameter and 0.8mm in thickness, and 50mg of weight). The samples were thermally treated at 300°C during 30 min followed by 400°C during 1.5h to obtain the properties required for this study. The cooling of the samples was performed slowly in the same oven. The irradiation of the samples was realized using a Gamma Cell-220 System (⁶⁰Co), with doses of 10Gy up to 20kGy. The TSEE readout system procedure was performed using a continuous flow of gas and associated electronics, and a temperature programmer that supplies a linear rate of 5°C/s. The thermal treatment for re-utilization of the materials was 300°C during 1 hour in an unsealed oven. The TSEE results obtained indicated that the pellets of Jade-Teflon composites may be applied to high-dose dosimetry (gamma radiation).

References

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