

Er+Ag-doped phosphate glass as luminescent dosimeters

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In the previews few years phosphate-based glasses from laser glass hosts were extensively studied and their crystallographic structure and optical properties were characterized using different spectroscopic techniques. For years much attention has been attracted to the research of the rare earth (RE) ions. Among them, erbium is the most interesting and a lot of work has been done on the spectroscopic properties of Er³⁺ doped phosphate glasses. The Dosimetric Materials Laboratory of the Instituto de Pesquisas Energéticas e Nucleares – LMD/IPEN traditionally researches TL and OSL materials and its applications. We recently studied the luminescent properties of erbium-doped phosphate glasses produced by the Federal University of Juiz de Fora, and the results are being published [1]. Now this work aims to present the results on investigations of TL and OSL properties of the Erbium with Silver-doped phosphate glasses as luminescent dosimeters for beta radiation dosimetry. The TL and OSL investigations were performed on a TL/OSL-DA-20 model RISØ reader and its coupled ⁹⁰Sr/⁹⁰Y source with initial dose rate of 0.1Gy s⁻¹. For the TL investigations, the reader was programmed to perform a linear heat up to 450°C with constant heating rate of 5°C s⁻¹. For the OSL investigations it was used continuous-wave (CW-OSL) mode of illumination of the Blue LED array and, 90 % of power and stimulation time of 60 s. The experimental findings of this work indicate that Erbium+Silver-doped phosphate glasses produced at Federal University of Juiz de Fora presents TL and OSL responses over the range of absorbed doses of 2 to 20 Gy beta radiation. The intrinsic efficiency and signal amplitude are greater than Er-doped glasses as well as the pure phosphate glass due to the presence of silver, which is known as a luminescent signal amplifier. The material also presents extended linearity range compared with pure phosphate glass. Further investigations are being carried out in order to determine its intrinsic efficiency and responses to other types and qualities of radiation.

Keywords: Erbium+Silver-doped phosphate glass; TL Dosimetry; OSL Dosimetry; Beta radiation

[1] Villani, D. et al. Investigations on luminescence properties of 3 mol% erbium-doped phosphate glass produced at Juiz de Fora Federal University. In: 10th International Conference on Luminescent Detectors and Transformers of Ionizing Radiation. 2018.