

THE USE OF THE TL AND OSL PHENOMENA FOR DETERMINATION OF ABSORBED DOSE RATES OF $^{90}\text{Sr}+^{90}\text{Y}$ SOURCES BY A POSTAL METHOD

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Introduction: Deformations or lesions of skin or eyes can be treated with special $^{90}\text{Sr}+^{90}\text{Y}$ sources (positioned in contact with the injured surface). These sources (clinical applicators) are still used in Brazil, even for esthetical treatments, and they need to be periodically calibrated [1,2]. In order to attend the calibration requirements of this kind of sources, the Calibration Laboratory (LCI) at the Instituto de Pesquisas Energéticas e Nucleares (IPEN) developed a postal dosimetric system with thermoluminescent (TL) dosimeters of $\text{CaSO}_4:\text{Dy}$, which has already been tested in some hospitals of São Paulo city [3]. The main advantage of this system is that there is no need any more to send the sources to the LCI, avoiding the absence problem of the sources at the radiotherapy clinics or hospitals. The main objective of this work is to expand the TL system including OSL detectors and to send it to a research laboratory at the Federal University of Sergipe (UFS) where clinical applicators are utilized, and to verify the new dosimetric system usefulness. Furthermore, the objective is also to test the TL and OSL response of $\text{Al}_2\text{O}_3:\text{C}$ commercial detectors and to apply this material at the postal dosimetric system.

Experimental: For the TL and OSL measurements, $\text{Al}_2\text{O}_3:\text{C}$ dosimeters, called TLD-500, produced by Rexon TLD Systems, with dimensions of 5.0 mm of diameter and 1.0 mm of thickness, were used. These detectors were characterized in relation to their response by means of tests of reproducibility, lower detection limit, dose-response curve, and energy dependence. The TL response was obtained using a Harshaw TLD Reader model 3500; the OSL measurements were taken using a OSL system, model DOIN-L001, manufactured by the Federal University of Pernambuco (UFPE), and a data acquisition system Logan, model SAD-2000. The irradiations for the dose-response curve, in both cases of TL and OSL measurements, were performed using a $^{90}\text{Sr}+^{90}\text{Y}$ clinical applicator calibrated at NIST, in this work used as a reference source. For the characterization of the TL and OSL detectors, a $^{90}\text{Sr}+^{90}\text{Y}$ source (1850 MBq, 1981) of the beta secondary standard system of LCI, BSS1, Buchler GmbH & Co., Germa-

ny, was used. The TL dosimeters and the OSL detectors were utilized to calibrate six clinical applicators.

Results and Discussion: The reproducibility study for the TL and OSL responses were realized exposing the detectors to the $^{90}\text{Sr}+^{90}\text{Y}$ source (1850 MBq, 1981), and irradiating them with a absorbed dose of 5 mGy, at a source-detector distance of 11 cm. In the case of TL response, the reproducibility obtained was 3.5%, and for the OSL response, the result obtained was 4.2%. TL and OSL dose-response curves using the NIST applicator were obtained in the dose interval from 1 Gy to 5 Gy, to be used in the calibrations of the clinical applicators of UFS. These curves presented a linear behaviour of the TL and OSL responses in the studied dose interval. The TL dosimeters and the OSL detectors were sent together for their irradiations at the laboratory of UFS. Then they returned to LCI, the evaluation of the irradiations were performed, and the calibration certificates could be issued.

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