CHARACTERIZATION OF OPTICALLY STIMULATED LUMINESCENCE OF RED JASPER FOR ELECTRON CLINICAL BEAM DOSIMETRY

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Introduction: Electron beams have been used in cancer therapy for more than 50 years. In the 1980s and 1990s, electrons from $^{90}Sr+^{90}Y$ sources were widely used in the treatment of small skin lesions and pterygium, but nowadays are no longer used [1]. Presently, electrons for therapy are obtainable from clinical linear accelerators with energies between 4 and 20 MeV. The great advantage of this type of beam is the rapid decrease in the depth dose distribution, which depends on the beam energy, allowing treatment of superficial lesions. For a better flatness of the dose deposition it can employ intensity modulated electron therapy (IMET), which enables the processing of irregular surfaces without requiring the use of bolus [2]. However, the introduction of more elaborate techniques of treatment also requires dosimetric procedures to ensure the safety and quality control to correct verification of conformational dose distribution. The use of dosimetry OSL in medical dosimetry is still limited, but the high sensitivity detectors as those based on Al_2O_3:C, allowed a accurated dosimetry of two-dimensional distributions of dose [3]. Alternative materials such as natural minerals have also been studied for this purpose. In a recent study, for example, it was shown that red jasper has applicability to OSL dosimetry of gamma radiation [4]. Thus, this study aims to investigate the behavior of red jasper samples in dosimetry of clinical electron beams from $^{90}Sr+^{90}Y$ and linear acellerators.

Experimental: Red jasper samples were obtained in Teofílo Otoni city, in Minas Gerais, Brazil. The samples were initially cleaned, pulverized, and grain diameters between 0.074 and 0.177 mm were obtained. For analysis, the Jasper red was used in powder form, with each measurement being made with portions of 50 mg. The samples were thermally treated at 300°C during 1h in open atmosphere. The samples were irradiated in the irradiator SAMARA, developed in the Physics Department of the Federal University of Sergipe, which has sources of $^{90}Sr+^{90}Y$. The dose rate at the surface of the samples was 20mGy/s±2mGy. The OSL readings were taken using LOE equipment - DEN-PE.

Results and Discussion: Figure 1 shows the dose-response curves of red jasper irradiated with $^{90}Sr+^{90}Y$ in the dose range of 0.5 to 3Gy.

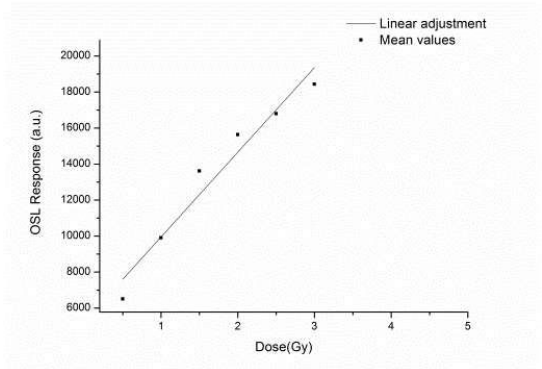

Fig.1 Dose-response curves of OSL response of red jasper samples irradiated with $^{90}Sr+^{90}Y$.

The OSL response presentes moderate linearity to the absorbed dose in the range studied, which represents a good dose range for radiotherapy studies. Now, are being evaluated the OSL responses of the samples exposed to electron beams from LINAC's with energies between 5 and 15 MeV.

References:

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