

Thermoluminescent and simulation dosimetry of the ^{125}I brachytherapy seed

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ABSTRACT

In order to provide the dosimetry for ^{125}I seed production in Brazil, Harshaw thermoluminescent dosimeter (TLD-100) will be used. Even if measurements with TLD-100 of the same batch of fabrication are performed, the precision of the response will not be the same. As a consequence, they must be measured one by one. This paper presents the calculation methodology for selection procedure to TLD-100 dosimeter used, embracing 142 TLD-100 dosimeters prepared by Harshaw Company on December 19th, 2005. These dosimeters are LiF type with a micro-cube (1mm x 1mm x 1mm) shape. Irradiations were performed using 36 ^{125}I seeds with activity of 0,623 mCi (23,05 MBq) on October 20th, 2006 for approximately 150 minutes, to guarantee a minimum of 5 Gy absorbed dose in each dosimeter. Different evanescence times have been used. These complete procedures were carried out four times in order to compare the data and minimize the systematic error. After the pre-selection of the TLD-100, It was choose 29 dosimeters of the batch to carry out the experimental measure of the dosimetric factors. It was measured for each TLDs a correlation factor for 1 Gy performed in X-ray therapy unit Dermopan-system, with 29 keV energy. The experimental measure was done in three concentrically positions of 20mm, 50 mm and 70mm. The values measured with the experimental apparatus had a good concurrence with the simulation method. The simulation method used in this work was a numerical calculation of semi-empirical dose rate using finite elements in cylindrical coordinates. This works presents also the simulation procedure used.

Key Words: Brachytherapy, Iodine 125, Quality Control.