Investigation of Different Options to Establish the Electron Equilibrium in Several Thermoluminescent Dosimeters

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Abstract: This study aimed to investigate effects of the TLD size and type on the absorbed dose value by using of Monte Carlo calculations. The options to establish the electron equilibrium was also studied on Lithium Fluride (LiF), Calcium Fluoride (CaF2) and Calcium Sulfate (CaSo4) TLDs. Several photon energies (0.08, 0.3, 1 and 10 MeV) were selected to cover the typical range of photon energies in medical applications. The Monte Carlo N-Particle (MCNPX 2.4.0) transport code was used to design simulations. The results of this study indicate that changing the thickness, area and volume of the TLD is affected on estimated values of the absorbed dose. In addition, the TLD response is dependent on the TLD type and incident photon energies. Also in common conditions, the TLD should be surrounded by the different wrapping materials with specified volumes or the bulky volume is located in front of TLD to establish the electron equilibrium. But other results of the present work revealed that if the air TLD is used even with the huge volume, and then photon energy fluence in the TLD is convoluted with mass energy absorption coefficients of the real TLD material can be precisely estimated values of the absorbed dose in all energies.

Key Words: Thermoluminescent Dosimeters, Electron Equilibrium, Absorbed Dose, Monte Carlo Code.