

AbstractID: 4722 Title: Dosimetric characteristics of Tm-170 as a radionuclide for its possible use in brachytherapy

In clinical brachytherapy several types of photon sources are used, mainly Cs-137, Ir-192, I-125, and Pd-103. The Tm-170 is a promising radionuclide for use in brachytherapy because of the low mean-energy (46.75 keV or 66.39 keV if the lines below 10 keV are removed) and the possible high specific activity ( $2.21 \times 10^{14}$  Bq/g for a half life of 128.6 days). Tm-170 is produced in a nuclear reactor by neutron absorption of the natural Tm-169 and decays mainly via  $\beta$ -emission. The maximum energies of the  $\beta$ -rays are 0.290 and 0.323 MeV. These  $\beta$  particles are thus absorbed in the source core and in the encapsulation cover producing bremsstrahlung that contributes significantly to the dose. These facts must be taken into account to design Tm-170 sources in order to calculate source and encapsulation thicknesses. The purpose of this study is to determine by means of the Monte Carlo method the dosimetric characteristics for a Tm-170 point source and for a hypothetical spherical source with an active core of Tm-170 encapsulated by a titanium or stainless-steel cover. Different active radius and cover thicknesses have been considered. The Monte Carlo GEANT4 code was used in this study to obtain the radial dose function of the sources studied. The radial dose function obtained is similar to the radial dose function of Ir-192 or Cs-137 sources. This fact and the low energy of the photons emitted by Tm-170 makes this radionuclide very interesting for its use in HDR or PDR brachytherapy. This study may be interesting for manufacturing future Tm-170 sources.