Thermalisation of high energy electrons in H_2O: from MeV to meV energies

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Medical applications based on radiation effects, as radiotherapy and more specifically brachytherapy, are demanding energy deposition models at the molecular level to improve accuracy in dose evaluations. Beta-emitter radioactive sources are commonly used for this purpose [1], so irradiated area will be well defined when high energy electron tracks are obtained for the whole thermalisation process. In order to simulate these tracks we present a Monte Carlo procedure based on the electron interactions through successive single collisions with the molecules constituting the medium which in this case we have assumed to be water. Depending on the energy range we have assumed different approximations to get a complete set of cross section for the dominant processes in that range. From few MeV down to few keV we assumed the first Born approximation as valid for differential and integral cross section calculation. In the energy range between 1 keV and 1 1eV our experimental total and ionization cross section [2] have been used as well as our optical potential calculation [3] for the elastic scattering. Below 1 eV elastic and inelastic channels have been considered according to the cross sectional data available in the literature [4]. For the whole energy range considered here energy range distribution functions used in the simulation were based on the experimental energy loss spectra [5] .

References

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