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THERMALISATION OF HIGH ENERGY ELECTRONS AND POSITRONS IN WATER VAPOUR

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Abstract. In this study we describe a method to simulate single electron tracks of electrons in molecular gases, particularly in water vapour, from relatively high energies, where Born(Inokuti 1971) approximation is supposed to be valid, down to thermal energies paying special attention to the low energy secondary electrons which are abundantly generated along the energy degradation procedure. Experimental electron scattering cross sections (Muñoz et al. 2007) and energy loss spectra(Thorn et al. 2007) have been determined, where possible, to be used as input parameters of the simulating program. These experimental data have been complemented with optical potential calculation (Blanco and García 2003) providing a complete set of interaction probability functions for each type of collision which could take place in the considered energy range: elastic, ionization, electronic excitation, vibrational and rotational excitation. From the simulated track structure(Muñoz et al. 2005) information about energy deposition and radiation damage at the molecular level can be derived.

A similar procedure is proposed to the study of single positron tracks in gases. Due to the lack of experimental data for positron interaction with molecules, especially for those related to energy loss and excitation cross sections, some distribution probability data have been derived from those of electron scattering by introducing positron characteristics as positroniun formation. Preliminary results for argon are presented discussing also the utility of the model to biomedical applications based on positron emitters.

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