PS14 - 2.7

ESR FOR HIGH DOSE DETERMINATION*

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1)Introduction - Alanine is a simple aminoacid, on irradiation at room temperature, predominantly free paramagnetic radicals of the type CH_3-CH-COOH are produced, which can be measured quantitatively using ESR. This paper reports the aplication of powder alanine/ESR dosimeter for measurement of the absorbed dose of ^{60}Co gamma rays and electron beams. The sample preparation details are described, as well as the analysis of the ESR signal to dose, the energy response, the influence of dose rate and effect of the ambient conditions on the fading of the ESR signal.
2)Materials and Methods - The irradiations were performed using a panoramic ^{60}Co gamma ray source and electrons emitted from an accelerator for industrial purposes. The ESR espectra was measured at room temperature using JES-ME- 3X ESR spectrometer with cylindrical T_{E011} mode cavity (Jeol) operating at a frequency of 9400 MHz (X). The parameters setting were as follow: magnetic field 3345 G; scan range 250 G; modulation frequency 100 kHz; microwave power 0.1 mW; time constante 0.3s; scan time 5 min; and the gain was always adjusted according to the applied absorbed dose.
3)Results - The ESR spectra was recorded as the first derivative of the paramagnetic absorption spectra where the response of the alanine was expressed as the maximum peak to peak amplitude of the ESR spectra and measurements taken at different days were normalized using a Mn^{2+} reference sample. The same signal-dose relationship was obtained for both gamma rays (1.25 MeV) and electron beams (1.14 MeV) and no dependence of the response on dose rate has been found in the range from 0.21 to 1.16 kGy/h. In the dose range of 10^2 to 10^5 Gy the dose response showed a linear relationship and the precision was less than 2%.
4)Conclusion - The obtained results give useful information on the care necessary to obtain the needed overall accuracy in the determination of absorbed dose.

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STOPPING POWER AND DOSE DISTRIBUTION IN WATER BY PROTON AND HYDROGEN IMPACT

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We develop stopping power calculations of molecular H_2O by impact of protons from 10 keV to 10 MeV-collision energies. The distorted wave model is used[1] where the neutral and proton charge states are studied using the First Born and Continuum-Distorted-Wave-Eikonal-Initial- State Approximations respectively. Contributions to the stopping power coming from the existing reaction channels are discriminated. Three representations of the H_2O molecule are employed: i) An atom of ten electrons; ii) A mixture (with density 1) of two atomic hydrogens an one oxygen atom; iii) The CNDO model. The double differential cross sections for electron emission obtained with the approximation described above are used to calculate radial distribution of dose along protons tracks.

[1] P.D. Fainstein, V.H. Ponce and A.E. Martinez , *Phys. Rev. A* **47**, 3055 (1993).