THE USE OF ELECTRON SPIN RESONANCE DOSIMETRY WITH EGGSHELL FOR DOSE ASSESMENT

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Body of Abstract: In this work the ESR signal based on the measurement of radiation induced radicals in calcium carbonate (CaCO3) obtained from eggshell was investigated. The ionising radiation produces an electron centre CO33- and a hole centre CO3- besides an oxygen vacancy with an electron the CO2- molecular ion, which also is formed. The g-value of the ESR centre is attributed to the CO2- and has axial symmetry with g - = 2,0018 and g // = 1,9970 and it is found to be close to the hydroxyapatite. Additional ESR lines were detected, but they are less pronounced in intensity. The work aims to standardise the sample preparation method and the measurements condition for practical application of this technique to emergency personal dosimetry. In this regard, practical consideration of sample preparation grains size, pre-irradiation heat treatment, ESR spectrum, spurious induced mechanical ESR signal, gamma radiation induced signal and measurement temperatures are discussed. The peak to peak amplitude values of the derivative of absorption are recorded for relative dose measurements. At very low doses many sweeps were taken, resulting in a final composite spectrum. The spectrum of a non-irritated reference sample is subtracted from the spectra of the irradiated samples. The batch reproducibility obtained is better than 99% (1s) and the signal reproducibility is better than 95%. The ESR response presents linear behaviour between 1 to 100Gy. No ESR signal dose rate dependence was observed. Experiments were carried out to estimate the minimum detectable dose limit, stability and dose assessment method. A careful analysis of the ESR spectra is presently in progress in order to under take and to identify the radicals involved.