

Development and dose evaluation of alanine dosimeter using boric acid as a binder

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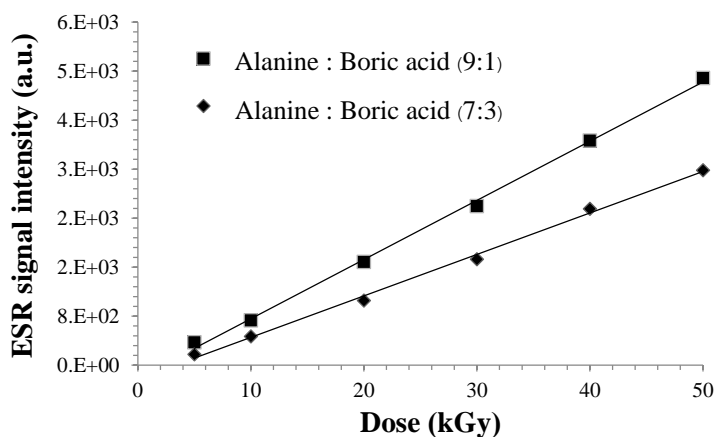
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We reported a dosimeter preparation, procedures for using the ESR/dosimetry method, and the resulting calibration curve for γ -irradiation in the range of 5-100 kGy. In the present investigation, dosimeters have been prepared by homogeneously mixing alanine and boric acid with ratios of 9:1 and 7:3 in a home-built ball milling for 40 min and subsequently pressing with a hydraulic pressure of 100 psi into small pellets. After an exposure to gamma radiation, The dosimeters were investigated by means of electron spin resonance (ESR) spectroscopy. Optimization of ESR parameters was carried out to increase signal-to-noise ratio and to reduce the uncertainty on ESR readout, resulting in the microwave power of 1.0 mW and modulation amplitude of 1.0 G for 1 scanning cycle.

Dose response of alanine/boric acid dosimeters depended on a proportion of alanine and absorbed dose. The linear relationship of the ESR signal was found in a range of 5 to 50 kGy, showing the ESR response slopes of 96.59 a.u./kGy and 67.70 a.u./kGy for alanine/boric acid with ratio 9:1 and 7:3, respectively. Fading of ESR signals was also studied up to 60 days. This investigation offers the possibility to fabricate the cost-effective alanine based dosimeters.



Keywords: Alanine dosimeter; Electron spin resonance; Gamma radiation