

Sensitivity comparison of two L-alanine doped blends to different photon energies

Chen, Felipe¹; Vega Ramirez, José^{1,2}; Nicolucci, Patrícia¹ and Baffa, Oswaldo¹

¹*Departamento de Física e Matemática, FFCLRP – Universidade de São Paulo, 14040-901, Ribeirão Preto – SP, Brasil.*

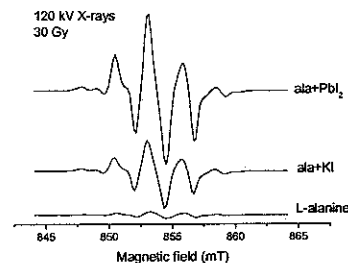
²*Departamento de Física, Universidad Nacional de San Agustín de Arequipa, Arequipa, Perú.*

Abstract

Blends of L-alanine (85% weight proportion) with KI (10%) and with PbI₂ (10%), these last two compounds acting as dopants, and with PVA (5%) acting as binder, were prepared in water at 80 °C. A blend of pure L-alanine (95%) with PVA (5%) was also prepared. The three blends were irradiated with photon beams of different energies (120 kV, ⁶⁰Co and 10 MV) with a unique dose of 30 Gy to compare their sensitivities for those three energies. EPR spectra of the three irradiated blends were recorded in a K-Band spectrometer (24 GHz) taking aliquots of about 4 mg for each blend. The energy sensitivity of a blend was defined as the peak-to-peak amplitude of its EPR spectrum central line.

For the ⁶⁰Co energy (1.25 MeV) the blends presented practically the same sensitivity indicating that the presence of the dopants does not affect the sensitivity of L-alanine. For 10 MV X-rays there was an increment (around 20% – 30 %) in sensitivity for the two L-alanine doped blends compared with the pure L-alanine blend (not doped). In the case of 120 kV X-rays, the blends ala+KI and ala+PbI₂ showed an increment of 10 and 20 times more sensitivity than the pure L-alanine blend.

It is concluded that the dopants KI and PbI₂ produce a great enhance of the L-alanine sensitivity to low-energy photons. For the same dopant's content (10%) in the blend, PbI₂ showed a better performance. These results encourage us to try to enhance the sensitivity of L-alanine even more increasing the dopant's content in the blend. Application of these L-alanine doped blends in the dosimetry in diagnostic radiology could be possible.



KEYWORDS: L-alanine, dopant, KI, PbI₂, EPR, K-Band, energy sensitivity.