

LOW ENERGY X-RAYS TL DEPENDENCE OF CaSO₄:Dy DOSIMETER BADGE

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A thermoluminescence dosimeter using calcium sulfate doped with dysprosium (CaSO₄:Dy) produced at IPEN¹ and used for dose evaluation in environmental and personal monitoring. Despite of its energy dependence, CaSO₄ shows high sensitivity as a distinct advantage. The dosimetry system consists of a polystyrene badge with three discs of CaSO₄:Dy +Teflon (6 mm diameter, 0.8 mm thick) under plastic (polystyrene 3 mm thick), lead (1 mm thick) and special lead filter with central hole of 2 mm (0.8 mm thick) filters. Those 13 mm diameter filters are projected to minimize energy dependence.

This work describes an effort to optimize the algorithm for dose and energy evaluation in the region of low energy based on the response of the CaSO₄ detectors under different filters. The energy dependence was calculated using PENELOPE² Monte Carlo code and then compared to the experimental TL results for X-rays with 24, 33, 48, 65, 83 and 118 keV of effective energies, and also for ⁶⁰Co gamma rays.

The results obtained from simulation were normalized to ⁶⁰Co energy. Within method uncertainty, the simulated energy response shows a good agreement with experimental results. The effect of k-shell of lead on absorbed energy by the dosimeter is also discussed.

References

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