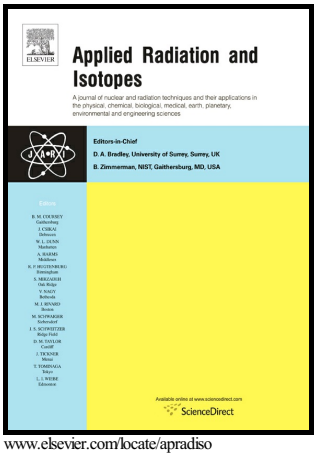

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Afterglow dosimetry performance of Beta Particle irradiated Lithium Zirconate

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Abstract:

In this work, we report for the very first time on the thermoluminescence (TL) and afterglow (AG) properties of Li_2ZrO_3. The ternary oxide Li_2ZrO_3 was synthesized by solid state reaction of a mixture of Li_2CO_3 and ZrO_2 subjected to thermal annealing at 400 °C for 2 h and 1000 °C during 24 h in air. The characteristic glow curves of beta particle irradiated samples exhibit an intense TL emission located around 150 °C. From the shape of the TL curve, a 0.4 form factor was determined, suggesting that first order kinetics processes are involved. The afterglow decay curves were recorded after exposure to beta particle irradiation in the dose range from 0.5 up to 2 kGy. The AG integrated in the time interval from 510 to 600 s after radiation exposure shows a linear dependence as a function of the irradiation dose from 0.5 up to 256 Gy. A method is proposed to compute the lower detection limit and the AG sensitivity and applied to the studied phosphors. Structural and morphological characterization were carried out by X-ray diffraction and Scanning Electron Microscopy, respectively. From the results presented, it is concluded that the AG response of the synthesized Li_2ZrO_3 presents features suitable to develop radiation detectors and dosimeters.

Keywords:

Li_2ZrO_3, Afterglow Dosimetry, Beta Particle Irradiation.