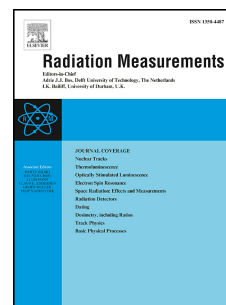


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## Comparative Study of Dosimeter Properties between Al<sub>2</sub>O<sub>3</sub> Transparent Ceramic and Single Crystal

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### Abstract

We have synthesized the Al<sub>2</sub>O<sub>3</sub> transparent ceramic by using spark plasma sintering (SPS) and investigated the dosimeter and scintillation properties for X-ray detections, in comparison with the single crystal. Under X-ray irradiation, emissions at 300, 400 and 693 nm were observed in both the samples. To identify the origins of these emissions, scintillation decay times were investigated. Based on the results, emissions at 300, 400 and 693 nm are attributed to F<sup>+</sup> centers, F centers and Cr<sup>3+</sup> impurity ions, respectively. The thermally-stimulated luminescence (TSL) glow curves of both the samples showed a main peak around 50 °C. In addition, glow peaks were observed at 190, 290 and 360 °C. The TSL spectra had broad emission bands in the 300, 400 and 693 nm, which approximately agreed with the scintillation spectra. The TSL response was confirmed to be linear to the irradiation dose for transparent ceramic over the dose range from 0.3 to 1000 mGy while the sensitivity of the single crystal was lower and the response range confirmed was from 30 to 1000 mGy.

**Keywords:** transparent ceramic, Al<sub>2</sub>O<sub>3</sub>, scintillator, dosimeter

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