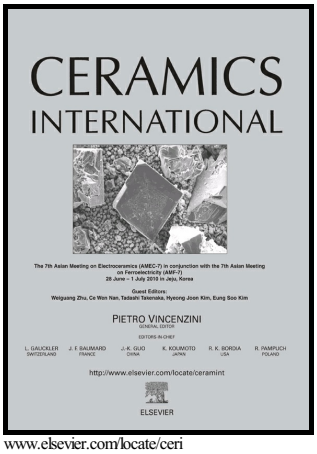

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Abstract

We have synthesized a MgO transparent ceramic by spark plasma sintering (SPS) and studied the dosimeter properties for X-ray detections, in comparison with the single crystal form. Further, we have characterized the optical and scintillation properties. Despite the same material compositions, the photoluminescence (PL) of the ceramic sample showed dominantly around 450 nm whereas the single crystal sample had a dominant emission in the NIR range. The PL lifetime of 450 nm were measured to be ~10 and ~50 ns which were typical for emissions by F^+ center in MgO. The scintillation spectra were similar to those observed in PL, but the lifetime was much longer on the micro-second scale. The TSL glow curves of MgO ceramic showed a main peak around 140 °C. The TSL spectrum at 140 °C had a broad emission band in the 300-400 range and around 600 and 750 nm, which approximately coincide with the scintillation spectra. The TSL response was confirmed to be linear to the irradiation dose for both samples over the dose range from 0.1 to 1000 mGy.

Keywords: transparent ceramic, MgO, scintillator, dosimeter, TSL

1. Introduction