Thermo stimulated luminescence studies of porous CdSiO₃ ceramic powders

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Abstract

Porous CdSiO₃ ceramic powders have been synthesized by a novel low temperature initiated self-propagating, gas producing solution combustion process. The solution combustion method renders a low-temperature synthetic route to prepare fine-grained CdSiO₃ powders with better sintering properties. The effects of temperature on crystalline phase formation, amount of porogens, and particle size of porous CdSiO₃ have been investigated. Complete crystalline single phase CdSiO₃ has been obtained at 950 °C. It is observed from scanning electron micrograph (SEM) that the powders become more and more porous (increase in pore diameter 0.5 – 5 µm) as the calcinations temperature increases. Thermo stimulated luminescence (TSL) studies have been carried out in both powdered and pelletized CdSiO₃ irradiated with gamma rays (⁶⁰Co) (having dose of 10-100 Gy). Two glow peaks one at ~ 390 K and another one at ~ 450 K were recorded in the entire sample. The effect of irradiation on any solid material is known to produce at least a pair of TL glow peaks arising due to recombination of two kinds of holes/electrons deficiency trapping centers with at least one type of electron/electron donor centers. The TL intensity in powdered sample is more compared to the pelletized CdSiO₃, which is attributed to the inter particle spacing and pressure-induced defects. Further, the TSL intensity of 450 K- glow peak increases with increase in irradiation dose. This glow peak may be used as a dosimetric peak in radiation dosimetry.

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