

Synthesis and characterization of undoped calcium aluminate (CaAl_2O_4) for thermoluminescence dosimetry

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Thermoluminescence (TL) and radioluminescence (RL) are powerful techniques used for dosimetry of ionizing radiations. TL is the luminescence induced by heat excitation of a material previously exposed to ionizing radiation. RL is a prompt luminescence emitted by a material under ionizing radiation exposure [1]. Calcium aluminate (CaAl_2O_4) has full potential to be designed for all possible TL applications like persistence luminescence and dosimetry [2]. CaAl_2O_4 was prepared by the combustion synthesis. Aluminum nitrate, calcium nitrate, and urea are used as starting materials. Urea acts as a fuel for combustion. The mixture of reagents was kept in a muffin furnace which maintains 500°C. After combustion, the by-product was annealed at 950°C for about 2 h. Phase formation was determined by X-ray diffraction (XRD) patterns. Investigations on the morphology and functional groups were analyzed by using the scanning electron microscopy (SEM). The sample was irradiated with an X-ray source (Moxtek 50kV Cabled). Preliminary results of the undoped sample showed three thermoluminescent peaks ~147°C, ~207°C, and ~286°C (3°C/s).

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References:

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