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89-1 EXPLORING LUMINESCENCE PROPERTIES AND DOSIMETRIC CHARACTERISTICS OF CaSO4 :RE,Mn (RE: Dy, Ce, Yb, Eu, Tb) PHOSPHORS SYNTHESIZED BY SLOW EVAPORATION ROUTE

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Abstract:

Ionizing radiation dosimetry devices are crucial for ensuring compliance with safe exposure limits in agriculture, industry, and medicine, particularly in monitoring and quantifying absorbed doses among occupationally exposed individuals (OEIs). Luminescent dosimeters, utilizing thermally stimulated luminescence (TL) and optically stimulated luminescence (OSL), play a pivotal role in this field. Diverse research are focused on characterizing and developing new materials for luminescent dosimetry, as well as exploring practical applications for existing materials. This study aimed to investigate and compare the luminescence properties of CaSO4 :Dy,Mn, CaSO4 :Ce,Mn, CaSO4 :Yb,Mn, CaSO4 :Eu,Li and CaSO4 :Tb,Mn composites synthesized via the slow evaporation route. Structural phase identification was conducted using X-ray diffraction, and energy-dispersive spectroscopy (EDS) spectra confirmed the presence of dopant ions in the crystalline matrices. Dosimetric characterization utilized pellets produced by incorporating Teflon into the phosphors. In-depth investigations included analysis of TL glow curves with Schott BG-39 and Hoya U-340 bandpass filters to regulate wavelengths, along with Continuous Wave Optically Stimulated Luminescence (CW-OSL) curves. The CaSO4 :Ce,Mn and CaSO4 :Eu,Mn composites exhibited intense TL/OSL signals compared to other samples and commercially available dosimeters. All samples demonstrated suitable OSL curves, showing exponential decay trends as charge traps were emptied, enhancing the applicability of more sensitive TL/OSL detectors. Overall, the evaluated dosimetric characteristics indicate significant potential for these new developed composites as TL/OSL detectors.

Keywords:

Luminescent dosimeters, thermoluminescence, optically stimulated luminescence, CaSO4 composites