Shape Tailored Green Synthesis of Ceo_2:Ho_{3+} Nanopowders, its Structural, Photoluminescence and Gamma Radiation Sensing Properties

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Abstract

CeO_2:Ho^{3+} (1–9 mol%) nanopowders have been prepared by efficient and environmental friendly green combustion method using *Aloe vera* gel as fuel for the first time. The final products are well characterized by powder X-ray diffraction (PXRD), scanning electron microscopy (SEM), fourier transform infrared (FTIR). Bell, urchin, core shell and flower like morphologies are observed with different concentrations of the *A. vera* gel. It is apparent that by adjusting the concentration of the gel, considerable changes in the formation of CeO_2:Ho^{3+} nano structures can be achieved. Photoluminescence (PL) studies show green (543, 548 nm) and red (645, 732 nm) emissions upon excited at 400 nm wavelength. The emission peaks at ~526, 548, 655 and 732 nm are associated with the transitions of $^5F_3 \rightarrow {}^5I_8$, $^5S_2 \rightarrow {}^5I_8$, $^5F_5 \rightarrow {}^5I_8$ and $^5S_2 \rightarrow {}^5I_7$, respectively. Three TL glow peaks are observed at 118, 267 and 204 °C for all the *γ* irradiated samples which specify the surface and deeper traps. Linear TL response in the range 0.1–2 kGy shows that phosphor is fairly useful as *γ* radiation dosimeter. Kinetic parameters associated with the glow peaks are estimated using Chen's half width method. The CIE coordinate values show that phosphor is quite useful for the possible applications in WLEDs as orange red phosphor.

Keywords

Green synthesis
Phosphor
Morphology
Luminescence
Kinetic parameters