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Effect of annealing time on the structure, morphology and optical properties of mixed phases of barium and strontium aluminates doped with 0.1% Tb3+ prepared by citrate sol-gel method

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Citrate sol-gel method was used to successfully prepare mixed phases of strontium and barium aluminate powders doped with 0.1% Tb3+. All powders were annealed at 1000 oC while varying the annealing time (AT) from 0.5 – 4 hours (h). The X-ray powder diffraction (XRD) results revealed that the prepared powders is the mixture of phases consisting of cubic (Sr3Al2O6, Ba3Al2H12O12), monoclinic (SrAl2O4, SrAl4O7), hexagonal (Ba0.6Sr0.4Al2O4, SrO, BaAl2O4) and orthorhombic (BaH4O3) crystal structures. Tb3+ did not influence the structure of mixed phases of BaAl2O4/BaH4O3/Ba3Al2H12O12/Ba0.6Sr0.4Al2O4/SrAl2O4,SrAl4O7/Sr3Al2O6/SrO (BBBBSSSS). The energy dispersive X-ray spectroscopy (EDS) mapping showed homogeneous distribution of elements on the surface. The scanning electron microscopy (SEM) images showed that as the AT increases the particle becomes more agglomerated and smoother. Transition electron microscopy (TEM) images suggested that the particle sizes were not influenced by the AT. Ultraviolet–visible (UV–vis) diffuse reflection spectroscopy confirmed that AT influenced the energy band gap (Eg) of the prepared nanophosphor. The Eg can be tuned between 5.1 and 5.7 eV. Photoluminescence (PL) results showed four emission peaks located around 489, 546, 589 and 618 nm which are attributed to 5D4 \rightarrow 7F6, 5D4 \rightarrow 7F5, 5D4 \rightarrow 7F4, and 5D4 \rightarrow 7F3 transitions of Tb3+ ions, respectively.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

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