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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% Tb<sup>3+</sup> 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% Tb<sup>3+</sup>. All powders were annealed at 1000 °C 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 (Sr<sub>3</sub>Al<sub>2</sub>O<sub>6</sub>, Ba<sub>3</sub>Al<sub>2</sub>H<sub>12</sub>O<sub>12</sub>), monoclinic (SrAl<sub>2</sub>O<sub>4</sub>, SrAl<sub>4</sub>O<sub>7</sub>), hexagonal (Ba<sub>0.6</sub>Sr<sub>0.4</sub>Al<sub>2</sub>O<sub>4</sub>, SrO, BaAl<sub>2</sub>O<sub>4</sub>) and orthorhombic (BaH<sub>4</sub>O<sub>3</sub>) crystal structures. Tb<sup>3+</sup> did not influence the structure of mixed phases of BaAl<sub>2</sub>O<sub>4</sub>/BaH<sub>4</sub>O<sub>3</sub>/Ba<sub>3</sub>Al<sub>2</sub>H<sub>12</sub>O<sub>12</sub>/Ba<sub>0.6</sub>Sr<sub>0.4</sub>Al<sub>2</sub>O<sub>4</sub>/SrAl<sub>2</sub>O<sub>4</sub>/SrAl<sub>4</sub>O<sub>7</sub>/Sr<sub>3</sub>Al<sub>2</sub>O<sub>6</sub>/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 (E<sub>g</sub>) of the prepared nanophosphor. The E<sub>g</sub> 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 5D<sub>4</sub> → 7F<sub>6</sub>, 5D<sub>4</sub> → 7F<sub>5</sub>, 5D<sub>4</sub> → 7F<sub>4</sub>, and 5D<sub>4</sub> → 7F<sub>3</sub> transitions of Tb<sup>3+</sup> 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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