

A Luminescence Study of Bi³⁺ Codoping on Eu³⁺ Doped YPO₄

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Abstract : YPO₄ nanoparticles codoped with Eu³⁺(5 at.%) and Bi³⁺(0, 1, 3, 5, 7, 10, 12, 15, 20 at.%) have been prepared in poly acrylic acid (PAA)-H₂O medium by hydrothermal synthesis by maintaining a temperature of 180oC. The crystalline structure of as-prepared and 500oC annealed samples transforms from tetragonal (JCPDS-11-0254) to hexagonal phase (JCPDS-42-0082) with increasing concentration of Bi³⁺ ions. However, 900oC annealed samples exhibit tetragonal structure. The crystallite size of the particles varies from 19-50 nm. The luminescence intensity increases at lower concentration of Bi³⁺ ions and then decreases with increasing Bi³⁺ ion concentrations. The luminescence intensity further increases on annealing at 500oC and 900oC. Further, 900oC annealed samples show sharp increase in luminescence intensity. Moreover, the samples follow bi-exponential decay indicating energy transfer from donor to the activator or non-uniform distribution of ions in the samples. The samples on excitation at 318 nm exhibit near white emission while at 394 nm excitation show emission in the red region. The as-prepared samples are redispersible and have potential applications in display devices, metal ion sensing, biological labelling, etc.

Keywords : charge transfer, sensitizer, activator, annealing

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