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Energy transfer and photoluminescence properties of Ce3+ and/or Tb3+-doped PbS nanorods.

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Abstract content
   (Max 300 words)

A series of luminescent material phosphors PbS:Ce3+;Tb3+ have been synthesized by low temperature chemical bath deposition (CBD) method. The UV-vis reflectance, photoluminescence (PL) emission and excitation spectra, and the effect of Ce:Tb molar ratio are investigated in detail. The X-ray diffraction (XRD) spectra of the PbS nanorods correspond to the various planes of a single hexagonal PbS phase. This observation was confirmed by the SEM micrograph. The morphology (e.g. size of nanorods) was found to be partially dependent on the amount and type of dopants. The nano powders show good optical properties with high reflectance in UV region. The UV-Vis spectra display an initially increase in percentage reflectance and shift of the absorption edge to the higher wavelength with an increase in Ce:Tb mole ratio up to 1:2 and reduces thereafter. The PL spectrum monitored at 450 nm exhibits two overlapping excitation bands at 276 and 282 nm, which is assigned to the 4d-5f transitions of Ce3+. Under excitation (λ_Exc=282), the PL spectrum exhibits an asymmetric blue emission band that extends from 430 to 550 nm with a maximum at 450 nm. The presence of the broadband transition from Ce3+ ions in the PL spectrum monitored at the 5D4 − 7F5 transition of Tb3+ proves the occurrence of energy transfer from Ce3+ to Tb3+.

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