

Photoluminescence in Cerium Doped Fluorides Prepared by Slow Precipitation Method

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Abstract : CaF_2 and BaF_2 doped with cerium were prepared by slow precipitation method with different molar concentration and different cerium concentration. Both the samples were also prepared by direct method for comparison. The XRD of $\text{BaF}_2\text{:Ce}$ shows that it crystallizes to BCC structure. The peak matches with JCPDS file no. 4-0452. Also, The XRD pattern of $\text{CaF}_2\text{:Ce}$ matches well with the JCPDS file number 75-0363 and crystallized to BCC phase. In CaF_2 , the double-humped photoluminescence spectra were observed at 320nm and 340nm when the sample was prepared by the direct precipitation method, and the ratio between these peaks is unity. However when the sample prepared by slow precipitation method the double-humped emission spectra of $\text{CaF}_2\text{:Ce}$ was observed at 323nm and 340nm. The ratio between these peaks is 0.58, and the optimum concentration is obtained for 0.1 molar CaF_2 with Ce concentration 1.5%. When the cerium concentration is increased by 2% the peak at 323nm vanishes, and the emission was observed at 342nm with the shoulder at 360nm. In this case, the intensity reduces drastically. The excitation is observed at 305nm with a small peak at 254nm. One molar BaF_2 doped with 0.1% of cerium was synthesized by direct precipitation method gives double humped spectra at 308nm and 320nm, when it is prepared with slow precipitation method with the cerium concentration 0.05m%, 0.1m%, 0.15m%, 0.2m% the broad emission is observed around 325nm with the shoulder at 350nm. The excitation spectra are narrow and observed at 290nm. As the percentage of cerium is increased further again shift is observed. The emission spectra were observed at 360nm with a small peak at 330nm. The phenomenon of shifting of emission spectra at low concentration of cerium can directly relate with the particle size and reported for nanomaterials also.

Keywords : calcium fluoride, barium fluoride, photoluminescence, slow precipitation method

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