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Photoluminescence studies of green emitting BaB8O13: Bi3+ phosphors prepared by solution combustion method

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Abstract

Undoped and bismuth (Bi(sup)3+)-doped barium octaborate (BaB(sub)8O(sub)13) powder phosphors were synthesized by solution combustion method. X-ray diffraction, Fourier transform infrared spectroscopy, scanning electron microscopy, UV–visible and photoluminescence spectroscopy were used to characterize the phosphors. X-ray diffraction patterns confirmed the formation of orthorhombic phase of BaB(sub)8O(sub)13. Scanning electron microscopy images showed agglomeration of particles with irregular shapes. The infrared stretching frequencies detected in the spectral wavelength range of 650–1600 cm(sup)-1 also confirmed the formation of the BaB8O13 host while the photoluminescence and the energy dispersive X-ray spectroscopy data confirmed the incorporation of Bi3+ ions in the BaB(sub)8O(sub)13 host lattice. The broad photoluminescence emission due to 1S(sub)0–(sup)3P(sub)1 transitions of Bi(sup)3+ ions was observed at 548 nm in the green region of the visible spectrum after exciting the powder phosphors at a wavelength of 271 nm using a monochromatized xenon lamp. The highest photoluminescence intensity was observed from BaB(sub)8O(sub)13: 0.11Bi(sup)3+ with the CIE coordinates of x=0.3267 and y=0.6004, suggesting that this phosphor can be used as a source of green light in light emitting devices of different types.