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Structural and luminescence properties of $GdBO_3$: Eu in different crystalline modifications

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$GdBO_3$ belongs to the category of rare earth borates. Its outstanding optical properties with high thermal and chemical stability enable them as potential candidates for solid-state lighting, plasma display panels etc. The motivation of this work is to understand the influence of local environments on luminescence properties of Eu^{3+} in three different phases of $GdBO_3$, namely monoclinic, triclinic and nano-crystalline forms as this will be helpful for selecting a suitable host for getting optimum luminescence and to get a basic understanding on phase and local environment dependent optical parameters. $GdBO_3$ containing 1at.% Eu^{3+} were prepared in nano-crystalline, monoclinic and triclinic forms in the present study based on hydrothermal, polyol and solid state reaction of B, Gd and Eu precursors and subjected structural and luminescence studies. TEM images and SAED patterns confirmed the formation of nanorods of $GdBO_3$ having the monoclinic structure (length~ 200 nm, width ~10 nm) while FTIR patterns have confirmed that in nanorods and triclinic phase boron exists in both diagonal and tetrahedral configurations. Unlike this in monoclinic $GdBO_3$ boron exists only as BO_4 structural units constituting B3O99- groups. The relative intensity ratios of electric dipole allowed to magnetic dipole transitions of Eu^{3+} in triclinic and nanorods of $GdBO_3$ are 2 and 2.3 respectively and are found to be higher than that of monoclinic phase (1.4). The CIE colour coordinates are found to be (0.60, 0.34) for monoclinic, (0.64, 0.36) for triclinic phases and (0.62,0.35) for nanorods, suggesting that the nanorods have improved red colour characteristics compared to the other two forms.

Biography

Ms. Ramya Nair completed her M.Sc. from University of Mumbai with an outstanding grade in the year 2012. During the master's program, she successfully completed six-month dissertation work at Tata Institute of Fundamental Research(TIFR), Mumbai. Afterward, she got selected in prestigious DAE fellowship scheme for Ph.D. in basic sciences and currently she is pursuing her research work as the senior research fellow at Chemistry Division of Bhabha Atomic Research Center, Mumbai. She has five papers published in journals of international repute and participated in several international conferences and workshops.

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