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SYNTHESIS,STRUCTURALPARAMETERS AND PHOTOLUMINESCENCE OF $NaSrBO_3$:Ce PHOSPHOR

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Abstract—**A series of Ce doped $NaSrBO_3$ phosphors were synthesized by solid state reaction.The synthesized materials were characterized using X-ray powder pattern for diffraction for confirmation.It is also compared with ICSD standard. The peaks of obtained XRD patterns match well with the standard pattern of $NaSrBO_3$. Various structural parameters viz.mean dislocation density,meanstrain,particle size were also calculated.Photoluminescence (PL)properties of synthesized phosphor were systematically investigated.The microstructures of the phosphors were studied by scanning electron microscope(SEM).The average size of the particle found to be 13.29nm which proves that the prepared sample is nanomaterial.The PL emission spectra of Ce^{3+}doped $NaSrBO_3$were observed at 433 nm for 360 nm excitation in UV range.The corresponding emission spectrum (λ_{ext} = 360 nm) shows an asymmetric band that extends from 370 to 510 nm with a maximum at approximately 433 nm, which is known to be the typical transition from the 5d excited state to the $^2F_{5/2}$ and $^2F_{7/2}$ ground state. Emission at 433 nm indicates that $NaSrBO_3$:Ce^{3}phosphor is blue light emitting phosphor. The entire characteristics revealed that Ce doped $NaSrBO_3$ phosphor isan excellent candidate for UV radiation-excited devices.**

Keywords: **$NaSrBO_3$,XRD,SEM, Photoluminescence.**

I. INTRODUCTION

Luminescent materials, also known as phosphors, have several applications ranging from fluorescent lamps, PL-LCD and plasma displays to conversion materials in solar cells and wavelength conversion phosphors in white LEDs. The search for new phosphors for various applications is widely recognized. Researchers in this field are exploring new hosts and dopants along with simplification of synthesis methods that can lead to cost reductions [1–6].

Borate compounds are known for their wide band gap. They are the best hosts for various activators. From the literature it is clear that borate compounds find several interesting applications, e.g. barium borate is a non-linear optical (NLO) material used for laser harmonic generation [7] and for forming the green component of tricolor TV phosphor [8]. In borate compounds the boron atom is coordinated by oxygen atoms to form a variety of atomic groups that affect physical properties in general and optical properties in particular [9]. In the past a few decades, rare earth borates have attracted considerable attention due to their practical applications as nonlinear optical (NLO), laser host, and luminescent materials. For example, $YAl_3(BO_3)_4$, $RECa_4O(BO_3)_3$ (RE= Y or Gd) [10], $La_2CaB_{10}O_{19}$ [11], and $Na_3La_9O_3(BO_3)_8$ [12]can be used as NLO crystals, Yb:$YAl_3(BO_3)_4$ and Nd:$GdCa_4O(BO_3)_3$ [13] are potential self frequency doubling laser crystals, and (Y, Gd) BO_3: Eu^{3+} serves as a good phosphor for plasma display panels (PDPs).

There is much interest in Ce^{3+}doped ionic crystals for applications in scintillators and tunable lasers [14]. Ce^{3+} ions are represented by a simple one-electron system. The electron configurations of the ground and excited states of Ce^{3+} are 4f1 and 5d1, respectively. The luminescent characteristics of Ce^{3+} ions are known to depend upon whether the charge compensatory vacancy is associated with Ce^{3+}ions in the cases of similar aliovalentsubstitution [15].In the last few years, several studies have been devoted to oxide scintillators doped with Ce ions. The Ce ion is used for its potential to yield fast scintillation in the 300–500 nmwavelength range due to electric dipole allowed 5d–4f transitions.

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