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Investigation of structural and optical properties of $Ba_{0.6}Mg_{0.2}Ca_{0.2}Al_2O_4$ ceramic

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Barium aluminate ($BaAl_2O_4$) is an insulator with hexagonal crystal structure, and it crystallized in space group P63 (No. 173) symmetries with cell parameters a = b= 10.449, c = 8.793 Å. It belongs to the family of stuffed tridymite tetrahedral structures. This structure consists of twisted AlO_4 tetrahedral linked to each other by their corners [1]. Metal ion-doped $BaAl_2O_4$ ceramics possess wide applications in the fabrication of efficient phosphor materials. In researches [2 and 3], a broad emission band at about 405 nm in the spectrum of undoped, non-reduced $BaAl_2O_4$ were reprted. Pandey and Chithambo [2] measured PL with UV-excitation at 248 nm and thermoluminescence, while the Benourdja et al. [3] evaluated CL spectra. Both author groups ascribed the broad emission band to native defect state transitions in $BaAl_2O_4$. Suriyamurthi and Panigrahi [4] reported the PL at room temperature of undoped $BaAl_2O_4$ by excitation with near UV light at 346 nm. They measured a main emission band at 500 nm and a shoulder at 430 nm and relatively assign these emission bands to V_k^{3+} defect centres. These contradictory results indicate that apart from the processes mentioned above, viz. annealing and excitation, there could be non-registered parameters such as synthesis conditions, purity, storage condition, etc. that affect the nature and concentration of defects in $BaAl_2O_4$. In this research, $Ba_{0.6}Mg_{0.2}Ca_{0.2}Al_2O_4$ ceramic was fabricated by sol-gel route and its optical and structural properties was evaluated compared to $BaAl_2O_4$ by techniques such as X-ray diffraction (XRD), field-emission scanning electron microscopy (FE-SEM), energy-disspersive X-ray spectroscopy (EDS), ultraviolet-visible (UV–Vis), and photoluminescence (PL).

***Keywords**: ceramic, optical properties, structural properties, sol-gel approuch*

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