Fluence dependence of ionoluminescence properties of Eu3+ activated BAM nanophosphors

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**Abstract**. BaMgAl10O17 (BAM) is a vacuum ultraviolet (VUV) phosphor and exhaustively used in plasma display panels (PDPs) and lamps, due to its high luminescence efficiency and good chromaticity. BAM are widely applied as host materials for VUV phosphors with Eg = 6.39 eV. Rare earth doped BAM have wide applications due to high luminescence, high chemical stability, long life and higher efficiency/bright emission characteristics in the visible region of electromagnetic spectrum. Doping of rare earth ions in BAM make them interesting as they can be used for wide range of visible spectrum. Ionoluminescence properties of Eu3+ activated Ba(1-*x*)MgAl10O17:Eu*x* (*x*=0.0, 0.1, 0.2, 0.03, 0.4, 0.5 and 0.6) (BAM) nanophosphors synthesized by chemical route were examined at different ion fluence of 120 MeV Ag9+ ions. Structural information of prepared nanophosphors was elucidated by X-ray diffraction and scanning electron microscopy. The oxidation state of the doped Mn ion in BAM was elucidated by X-ray absorption near edge measurements of Mn K-edge and results show that Eu ions are in trivalent state. The main intense emission peak exhibited at 612 nm was attributed to 5D0 → 7F2 electric dipole transition of Eu3+ ion. The other relatively weak observed IL emission peaks are centered at 590 and 700 nm are attributed to the characteristic luminescence centers activated by Eu3+ ions corresponding to 5D0 → 7F1and 5D0 → 7F4 transitions, respectively. From the IL spectra, it is confirmed that all the IL bands are associated with E3+ ion only and no band associated with Eu2+ ions is observed. It is also supported by the XANES results that the dopant oxidation state is 3+ only. Anomalous behaviour of fluence dependence of IL intensity was observed. For 1 and 2% Eu doping, the IL intensity increases with ion fluence followed by a reduction after certain fluence, while 3% Eu doped BAM showed random fluence dependence. On the other hand, IL intensity decreases initially with ion fluence and start increasing after certain fluence. The fluence at which the IL intensity started to decrease, or increase is lower as compared to the next doping percentages.

References:

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