Minor research Project "Luminescence studies on $M_2MgSi_2O_7$ (M=Sr,Ca,Ba) doped with Eu^{2+}, RE^{3+} (RE=Dy,Tb,Tm)"

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Conclusion

Samples of $Ba_2MgSi_2O_7$ doped with 0.5 mol% of Eu^{2+} and varying concentration of Tm^{3+} were prepared by solid state reaction technique. A broaden green colour PL emission at 510 nm were obtained when excited at 368nm. Optimum PL emission were obtained when concentration of Tm^{3+} was 1.5 mol%. This sample with 1.5 mol% of Tm was used for further studies. X-ray diffraction pattern of the sample confirmed proper phase formation of the sample and refined lattice parameters were calculated using rietveld refinement process. For investigating about the suitability of prepared phosphor for its long lasting ability; TL kinetic parameters were calculated. The values of TL kinetic parameters were supportive of suitable trap formation responsible for long lasting abilities. Afterglow curve of the sample was also recorded after 5 min of UV irradiation, and afterglow was noted even after 760s. It was predicted that Tm^{3+} ions and oxygen vacancies creates the discrete trap levels, which is responsible for elongating the afterglow duration. In all this phosphor can be used in light emitting devices.

Prepared samples follow tetragonal symmetry. The PL emission is due to transitions of Eu^{2+} arising from sub-levels of $4f^6 5d^1$ configuration to $^8S_{7/2}$ level of the $4f^7$ configuration. Best PL intensity was found when Eu/Tb was 0.5/1.5 mol%. Fluorescence decay curve was found to be best fitted using an equation having double exponential terms, expressing fast and slow decay section. Decay

onstants were 7.60 and 86.95 ns for slow and fast decay ctions respectively. The number of trapped charge car-er, in turn, depends on the concentration of oxygen acancies, the concentration of traps created due to Tb^{3+} ad the depth of these trap levels. For a suitable trap depth, ie trap concentration is directly proportionate to the Tb^{3+} ons. In support to the statement that suitable traps are ormed, which are responsible for long afterglow, trap epth was calculated. The values of trap depth ranges etween of 0.76–0.82 eV are indicative that traps are nei-ier too shallower nor too deep. There are possibilities of e-trapping before the recombination, this elongates the uration of afterglow.

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