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Deposition and characterization of $CaAl_2O_4:Eu^{2+}$ thin films by rf magnetron sputtering method

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Eu^{2+} doped Ca-aluminate has been studied for a blue phosphor material because of the excellent luminescent properties. It shows intense broad band emissions that originate from the electronic transition of $4f^7$ - $4f^65d^1$ of Eu^{2+} ions. There are three Ca^{2+} sites in $CaAl_2O_4$: one is nine-coordinated and the others are six-coordinated by oxygen atoms. Eu^{2+} ions prefer the former to the latter due to the atomic size difference.

In this experiment, divalent europium doped calcium aluminate ($CaAl_2O_4:Eu^{2+}$) phosphor thin films were prepared by rf magnetron sputtering. The effects of sputtering parameters, annealing conditions, and substrates on the crystallinity and optical properties were investigated. Growing phases strongly depended on the sputtering parameters and substrates, and accordingly luminescent properties were correlated with the structural properties. High quality crystalline phases could be achieved on sapphire substrates, while not on amorphous substrates such as quartz and SiO_2/Si. $CaAl_2O_4:Eu^{2+}$ thin films exhibited a intense blue emission at 440 nm with 330 nm excitation after annealing process.