Contribution ID: **460** Type: **Poster Presentation**

Structural and luminescence properties of yellow Y3Al5012:Ce3+ thin film phosphors prepared by Pulsed Laser Deposition

Thursday, 12 July 2012 17:30 (2 hours)

Abstract content
   (Max 300 words)

Recently oxide phosphors have gained much attention because of the variety of materials available and chemical stability as compared to sulfide phosphors. Y3Al5O12 Eu2+ (YAG) crystal is an excellent host material which is able to compatibly accept divalent and/or trivalent activators from both rare earth and transition metal groups. It is well known that YAG is a highly efficient yellow phosphor. However, these phosphors in the form of thin films have not yet been fully realized due to technical difficulties. We prepared thin film type YAG phosphors on silicon (100) substrate using a pulsed laser deposition technique. The luminescent and structural properties of thin film phosphors were monitored as a function of key processing parameters such as oxygen partial pressure inside the deposition chamber, deposition time, laser energy density and the type of post deposition treatments used. The surface morphology of the as grown thin films was strongly affected by the growth process. Electron diffraction spectroscopy confirm the presence of the Y, Al, O, Ce and and Si. XRD measurements revealed Y3Al5O12 structure when grown at low temperature from 500℃ to 1000℃, however, other phases such as YAlO3 and Y4Al2O9 are observed as impurities. The PL results, which are in good agreement with the XRD data, showed that Y3Al5O12 phase was relatively dominant in the film deposited in a vacuum, so emission spectra is strong at around 580 nm. Even though we could not obtain homogenous phases, by optimizing these processing parameters, thin films with large homogenous areas and a high photoluminescence could be produced.

Keywords: Photoluminescence, poly-phase, Y3Al5O12 Eu2+, Yellow emission

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Session Classification: Poster Session

Track Classification: Track A - Division for Condensed Matter Physics and Materials