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The influence of oxygen partial pressure on material properties of Eu^{3+} -doped Y_2O_3 thin films deposited by Pulsed Laser Deposition method.

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1. Introduction

Eu^{3+} -doping has been of interest to improve the luminescent characteristics of thin-film phosphors. Europium-doped Y_2O_3 exhibits strong UV and cathode ray-excited luminescence, so it is widely used as red phosphors for low-pressure fluorescent lamps, cathode-ray tubes and plasma display panels [1]. Also, the hexagonal Y_2O_3 is a good host material for rare earth ions. In recent years, the Y_2O_3 :Eu has received much attention for its tremendous potential applications in optical display and lighting materials and basic science research on special luminescent spectra. Nanoscale and thin film Y_2O_3 :Eu has remarkably different luminescent properties from those of bulk samples: such as emission line broadens, lifetime changes and its spectra shift [2]. In this study Y_2O_3 :Eu thin films have been deposited with the pulsed laser deposition technique in an O_2 environment. The oxygen pressure was changed from 0 to 140 mtorr.

2. Results

The X-ray diffraction patterns (Fig.1) show mixed phases of cubic and hexagonal crystal structures. As the oxygen partial pressure increased, the crystallinity of the films improved. Further increase of the O_2 pressure to 140 mtorr reduced the crystallinity of the film. Similarly, both scanning electron microscopy and atomic force microscopy confirmed that an increase in O_2 pressure affected the morphology of the films. The average band gap of the films calculated from diffuse reflectance spectra using the Kubelka-Munk function was about 4.75 eV. The photoluminescence measurements (Fig.2) indicate red emission of Eu^{3+} -doped Y_2O_3 thin films with the most intense peak appearing at 619 nm, which is assigned to the $5D_0$ - $7F_2$ transition of Eu^{3+} . This most intense peak is totally quenched at higher O_2 pressures. This phosphor may be good promising material for applications in the flat panel displays.

Are you currently a postgraduate student? (Yes/No)

YES

At what level of studies are you currently? (Hons/MSc/PhD)

PhD

Please provide the name and email address of your supervisor.

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