Abstract

Thin films of $(Y–Gd)_3Al_5O_{12}$: Ce^{3+} phosphor were fabricated on Si (100) substrates by pulsed laser deposition (PLD) method using Nd:YAG laser of 266 nm, 10 Hz and 8 ns pulse width. The films were deposited under vacuum, oxygen, argon and nitrogen atmospheres at 300 °C and 4.5 cm substrate-target distance. The influence of deposition atmosphere on the structure, morphology and luminescence properties of the films have been investigated. X-ray diffraction patterns show the $Y_3Al_5O_{12}$ cubic structure with a dominant (420) peak orientation and a slight peak shift which depend on the deposition atmosphere. The crystalline quality of the argon and nitrogen prepared films are poor but improves significantly for the film samples in vacuum and oxygen atmosphere. Scanning electron microscopy (SEM) images showed that the deposition atmosphere has a considerable effect on the morphology and particle size distribution, with film deposited under vacuum depicting highest particle number density followed by film deposited in oxygen atmosphere. The EDX analysis confirmed the presence of the elements; Y, Gd, Al, O and Ce in the films. Photoluminescence (PL) excitation results showed two prominent peaks at 339 and 467 nm, from which the emission was measured. The PL spectra exhibit broad band emission at around 545 nm attributed to the *5d→4f* electronic transitions of Ce^{3+} in the phosphor. A considerable reduction in the emission intensity for the film grown in nitrogen is observed, suggesting that the presence of large size particulates on the surface affected the luminescence properties.