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Effect of different annealing times on the structure of Y3(Al,Ga)5O12:Tb thin film grown by PLD

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Abstract content
   (Max 300 words)

Y3(Al,Ga)5O12:Tb thin films were grown on Si (100) substrates using the pulsed laser deposition technique in an O2 working atmosphere. The influence of different annealing time on the optical, morphology and the structure was investigated. Atomic force microscopy showed an increase in grain size with an increase in annealing time. The photoluminecent emission spectrum presented similar characteristics for all different annealing times, and the emissions are described by the well-known 5D4−7FJ (J=6, 5, 4, 3…) transitions of the Tb3+ ion. The main PL emission peak was due to the 5D4⟶7F5 transition of Tb3+ and was measured at a wavelength of 544 nm with minor peaks at 489 nm (5D4⟶7F6), 561 nm (5D4⟶7F4) and 625 nm (5D4⟶7F3)1,2. New excitation band located at 200 nm was observed from all the annealed films which pointed to a change in the chemical environment, owing to the fact that, the 5d level depends strongly on the nature of the host due to a greater radial extension of the 5d orbital. Shift in the peak position to lower diffraction angles was also observed in the X-ray diffraction results compared to the pattern of the Y3(Al,Ga)5O12:Tb powder and other thin films1,2.

References

(1) A. Yousif, H.C. Swart, O.M. Ntwaeaborwa, Appl. Surf. Sci., 2012 (258) 6495.
(2) A. Yousif, H.C. Swart, O.M. Ntwaeaborwa, E. Coetsee, Appl. Surf. Sci., 2013 (270) 331.

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PhD

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