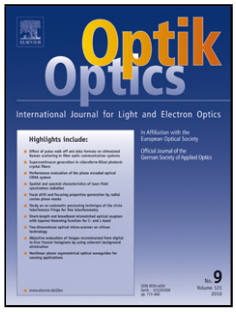

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PII: S0030-4026(18)31325-1
DOI: https://doi.org/10.1016/j.ijleo.2018.09.025
Reference: IJLEO 61464

To appear in:

Received date: 15-2-2018
Revised date: 4-9-2018
Accepted date: 7-9-2018

Please cite this article as: Keriti Y, Keffous A, Gabouze N, Trari M, Concentration-dependent visible photoluminescence of In_2O_3: Er^{3+} under 532 nm excitation, *Optik* (2018), https://doi.org/10.1016/j.ijleo.2018.09.025

Concentration-dependent visible photoluminescence of In_2O_3: Er^{3+} under 532 nm excitation

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Abstract

In_2O_3 thin films were doped with Er^{3+} at different concentrations (0.5 - 2%) by sol-gel method and annealed at 1000 °C. The In_2O_3: Er^{3+} films were characterized by X-ray diffraction, atomic force microscopy, scanning electron microscopy, X-ray photoelectron spectroscopy, photoluminescence (PL) and ellipsometry. The films are polycrystalline with a cubic structure related to In_2O_3. The trivalent state of Erbium in the In_2O_3 crystal is confirmed by photo electron spectroscopy. Doped films were excited under selective Er^{3+} excitation at 532 nm; the visible Er^{3+}-related emission is observed in the photoluminescence spectra and the major emissions occur in the green region with strongest lines at 548 and 567 nm. They are mainly produced by the Stark split $^2H_{11/2}$ and $^4S_{3/2}$ transitions to $^4I_{15/2}$ ground state and highest emission is observed on In_2O_3: 1% Er^{3+}.

Keywords: In_2O_3 thin films; Sol-Gel; Rare earth; Photoluminescence; Er^{3+}-related emission; Structural properties.

1. Introduction

In_2O_3 thin films has attracted a great interest as wide band gap semiconductor (~ 3.7 eV) because of the high optical transmission in the visible region (> 80%) **[1]**. Therefore, In_2O_3 can be used in many fields such as solar cells, light emitting diodes, memory storage devices