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PII: S0040-6090(18)30664-3
DOI: doi:10.1016/j.tsf.2018.10.003
Reference: TSF 36920

To appear in: *Thin Solid Films*

Received date: 28 January 2018
Revised date: 20 September 2018
Accepted date: 1 October 2018

Please cite this article as: Suliman Eltayeb Elhadi, Chao Liu, Zhiyong Zhao, Kai Li, Xiujian Zhao , Structure and optical properties of ZnO/Zn2SiO4 composite thin films containing Eu3+ ions. Tsf (2018), doi:10.1016/j.tsf.2018.10.003

Structure and optical properties of ZnO/Zn_2SiO_4 composite thin films containing Eu^{3+} ions

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Abstract

ZnO and ZnO/Zn_2SiO_4 thin films doped with 3% Eu^{3+} ions were prepared through sol-gel dip-coating and subsequently thermal annealing in the range of 600-900 °C. Effects of zinc and silica concentration on the structure and optical properties of these thin film specimens were investigated using thermogravimetric differential scanning calorimetry, X-ray diffraction, scanning electron microscopy, Fourier transform infrared spectroscopy and emission spectroscopy. Transparent thin films containing ZnO nanocrystals and Zn_2SiO_4 nanocrystals were fabricated. It was found that Eu^{3+} ions were mainly resided in the amorphous matrix or the surface of the nanocrystals, instead of being incorporated into the nanocrystals. As a result, these composites showed intense