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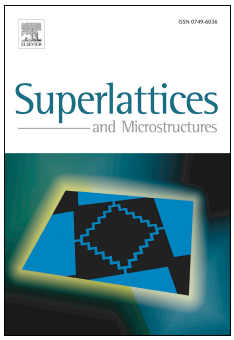

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Platinum Doping Effect on In_2O_3 *MSM IR* Photodetectors

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Abstract

The un-doped and platinum-doped In_2O_3 thin films were deposited for the investigation of platinum doping effect on the structural, morphological and electrical properties of In_2O_3 based metal-semiconductor-metal infrared photodetectors. The In_2O_3 metal-semiconductor-metal infrared photodetectors were also fabricated for obtaining the electrical characteristics such as the carrier recombination lifetime, diffusion length, carrier density, mobility, saturation current, barrier height, series resistance and ideality factor. It was seen from the characterization results that the *Pt* dopant usage has a prominent effect on properties of In_2O_3 metal-semiconductor-metal infrared photodetectors which are not extensively studied in the literature.

Keywords: *In_2O_3; MSM; IR Photodetectors; XRD; HALL; I-V.*

1. Introduction

Transparent conductive oxide (*TCO*) materials such as indium oxide (In_2O_3), tin-doped indium oxide (*ITO*), zirconium dioxide (ZrO_2), tungsten oxide (WO_3), zinc oxide (*ZnO*), aluminum-doped zinc oxide (*AZO*), titanium oxide (TiO_2) and gallium-doped zinc oxide (*GZO*) have been attracted noteworthy interest owing to their extensive applications in the optoelectronic and electrochemical areas [1–6]. Among these materials, In_2O_3 has been comprehensively used as an n-type semiconducting binary oxide material, which has wide band gap (*3.5–3.7 eV*), high electrical conductivity, high optical transparency and excellent carrier transport capability [7–9]. Despite these, the structural, electrical and optic properties of In_2O_3 thin films have been intensely debated [10]. It was seen that the properties of the *TCO* based devices can be enhanced with adjusting the nanostructured coatings [11,12]. Thereby, the enhancement on the properties of In_2O_3 thin film was obtained by doping the pure In_2O_3 with

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