Accepted Manuscript

Multilayer MgZnO/ZnO thin films for UV photodetectors

Vijay S. Rana, Jeevitesh K. Rajput, Trilok K. Pathak, L.P. Purohit

PII: S0925-8388(18)32260-6

DOI: 10.1016/j.jallcom.2018.06.139

Reference: JALCOM 46475

To appear in: *Journal of Alloys and Compounds*

Received Date: 24 April 2018

Revised Date: 11 June 2018

Accepted Date: 13 June 2018

Please cite this article as: V.S. Rana, J.K. Rajput, T.K. Pathak, L.P. Purohit, Multilayer MgZnO/ZnO thin films for UV photodetectors, *Journal of Alloys and Compounds* (2018), doi: 10.1016/j.jallcom.2018.06.139.

Multilayer MgZnO/ZnO Thin Films for UV Photodetectors

Vijay S. Rana[a], Jeevitesh K. Rajput[a], Trilok K. Pathak[a,b], L.P. Purohit[a*]

[a]Semiconductor Research Lab, Department of Physics, Gurukula Kangri University, Haridwar, India

[b]Department of Physics, TKCOE, Teerthanker Mahaveer University, Moradabad, India

[*]**Corresponding author Email: proflppurohitphys@gmail.com**

Abstract

$Mg_yZn_{1-y}O$/ZnO thin films have been deposited on soda lime glass substrates by using sol–gel spin coating technique with varying Mg contents (y = 2, 4, 6, 8 at. %). X-ray diffraction (XRD) studies indicate that films exhibit the wurtzite phase with a preferential c-axis (002) orientation. The scanning electron micrographs revealed that at low doping level round and oval shaped microstructure were formed and on increasing Mg content nanoflower and nanoplate morphology were found. The transmittance of the thin films was measured in the wavelength range 300 nm - 800 nm and the bandgap increased from 3.25 eV to 3.29 eV with increasing Mg content. The I-V measurements were performed in dark and illumination conditions show Ohmic behaviour. $Mg_yZn_{1-y}O$/ZnO (y=2 at. %) thin films show high stability and fast switching UV photoresponse behaviour. The highest responsivity of 0.16 A/W was obtained at 3.2 mW/cm^{2}exposure of UV light (365 nm) at 5 V bias voltage.

Key words:MgZnO/ZnO; Sol-gel method; I-V characteristics; Photodetection.

1. Introduction

Ultraviolet (UV) photodetectors (PDs) based wide bandgap semiconductors have been stabilised and used in different potential applications such as UV-photography, chemical agent sensing, UV-astronomy and flame detection [1,2]. For the preparation of UV photodetectors many aspects were approached, such as p-n junction [3,4], Schottky junction, metal-semiconductor-metal (MSM) [5], and their photo detection performance was explored extensively [6]. ZnO is wide band gap (3.37 eV) semiconductor and large excitonic energy (60 meV) [7] which is useful for optoelectronic applications such as UV detectors [8], LEDs [9], Laser [10]. The wavelength of emission or detection can be modulated by alloying ZnO with a higher bandgap material [11-12]. The bandgap of zinc oxide can be tuned by alloying