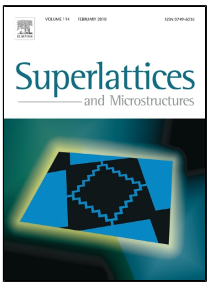
Accepted Manuscript



Effect of Ag doping on the structural, electrical and optical properties of ZnO grown by MOCVD at different substrate temperatures

A. Ievtushenko, V. Karpyna, J. Eriksson, I. Tsiaoussis, I. Shtepliuk, G. Lashkarev, R. Yakimova, V. Khranovskyy

PII:	S0749-6036(17)33003-3
DOI:	10.1016/j.spmi.2018.03.029
Reference:	YSPMI 5559
To appear in:	*Superlattices and Microstructures*
Received Date:	22 December 2017
Revised Date:	09 March 2018
Accepted Date:	12 March 2018

Please cite this article as: A. Ievtushenko, V. Karpyna, J. Eriksson, I. Tsiaoussis, I. Shtepliuk, G. Lashkarev, R. Yakimova, V. Khranovskyy, Effect of Ag doping on the structural, electrical and optical properties of ZnO grown by MOCVD at different substrate temperatures, *Superlattices and Microstructures* (2018), doi: 10.1016/j.spmi.2018.03.029

Effect of Ag doping on the structural, electrical and optical properties of ZnO grown by MOCVD at different substrate temperatures

A. Ievtushenko[1], V. Karpyna[1], J. Eriksson[2], I. Tsiaoussis[3], I. Shtepliuk[1,2], G. Lashkarev[1], R. Yakimova[2] and V. Khranovskyy[2]

[1]*I. Frantsevich Institute for Problems of Material Science, NASU, 3 Krzhizhanovskogo str., 03680, Kyiv, Ukraine, e-mail: a.ievtushenko@yahoo.com*

[2]*Department of Physics, Chemistry and Biology, Linköping University, S-581 83, Linköping, Sweden*

[3]*Department of Physics,Aristotle University of Thessaloniki, 54124, Thessaloniki, Greece*

Abstract

ZnO films and nanostructures were deposited on Si substrates by MOCVD using single source solid state zinc acetylacetonate (Zn(AA)) precursor. Doping by silver was realized in-situ via adding 1 and 10 wt. % of Ag acetylacetonate (Ag(AA)) to zinc precursor. Influence of Ag on the microstructure, electrical and optical properties of ZnO at temperature range 220 – 550 °C was studied by scanning, transmission electron and Kelvin probe force microscopy, photoluminescence and four-point probe electrical measurements. Ag doping affects the ZnO microstructure via changing the nucleation mode into heterogeneous and thus transforming the polycrystalline films into a matrix of highly *c*-axis textured hexagonally faceted nanorods. Increase of the work function value from 4.45 to 4.75 eV was observed with Ag content increase, which is attributed to Ag behavior as a donor impurity. It was observed, that near-band edge emission of ZnO NS was enhanced with Ag doping as a result of quenching deep-level emission. Upon high doping of ZnO by Ag it tends to promote the formation of basal plane stacking faults defect, as it was observed by HR TEM and PL study in the case of 10 wt.% of Ag. Based on the results obtained, it is suggested that NS deposition at lower temperatures (220 - 300 °C) is more favorable for *p*-type doping of ZnO.

Key words: *ZnO nanostructures; silver doping; morphology; photoluminescence; work function*

PACS: 81.05.Dz, 81.07.-b, 81.15.Gh, 73.30.+y

*Corresponding author: *a.ievtushenko@yahoo.com*

Tel.: +38 044 424 3228, Fax: +38 044 424 21 31