Accepted Manuscript

Synthesis of highly conductive thin-walled Al-doped ZnO single-crystal microtubes by a solid state method

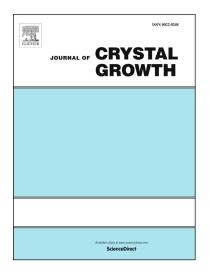
Shuopeng Hu, Yue Wang, Qiang Wang, Cheng Xing, Yinzhou Yan, Yijian Jiang

PII: S0022-0248(18)30153-2

DOI: https://doi.org/10.1016/j.jcrysgro.2018.03.041

Reference: CRYS 24549

To appear in: Journal of Crystal Growth



Please cite this article as: S. Hu, Y. Wang, Q. Wang, C. Xing, Y. Yan, Y. Jiang, Synthesis of highly conductive thin-walled Al-doped ZnO single-crystal microtubes by a solid state method, *Journal of Crystal Growth* (2018), doi: https://doi.org/10.1016/j.jcrysgro.2018.03.041

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Synthesis of highly conductive thin-walled Al-doped ZnO single-crystal

microtubes by a solid state method

Shuopeng Hu^a, Yue Wang^a, Qiang Wang^b, Cheng Xing^b, Yinzhou Yan^{b,*}, Yijian Jiang^b

^a College of Applied Sciences, Beijing University of Technology, Beijing 100124, P. R. China

^b Institute of Laser Engineering, Beijing University of Technology, Beijing 100124, P. R. China

Abstract: ZnO has attracted considerable attention in fundamental studies and

practical applications for the past decade due to its outstanding performance in gas

sensing, photocatalytic degradation, light harvesting, UV-light emitting/lasing, etc.

The large-sized thin-walled ZnO (TW-ZnO) microtube with stable and rich

V_{Zn}-related acceptors grown by optical vapor supersaturated precipitation (OVSP) is a

novel multifunctional optoelectronic material. Unfortunately, the OVSP cannot

achieve doping due to the vapor growth process. To obtain doped TW-ZnO

microtubes, a solid state method is introduced in this work to achieve thin-walled

Al-doping ZnO (TW-ZnO:Al) microtubes with high electrical conductivity. The

morphology and microstructures of ZnO:Al microtubes are similar to undoped ones.

The Al³⁺ ions are confirmed to substitute Zn²⁺ sites and Zn(0/-1) vacancies in the

lattice of ZnO by EDS, XRD, Raman and temperature-dependent photoluminescence

analyses. The Al dopant acting as a donor level offers massive free electrons to

increase the carrier concentrations. The resistivity of the ZnO:Al microtube is reduced

down to ~ 10^{-3} Ω •cm, which is one order of magnitude lower than that of the undoped

microtube. The present work provides a simple way to achieve doped ZnO tubular

components for potential device applications in optoelectronics.

Keywords: A1. Doping; A1. Characterization; A3. Optical vapor supersaturated

precipitation; A3. Solid state method; B1. Zinc compounds; B2. Semiconducting II-VI

materials

* Corresponding author: Tel: +86(0)1067393017 Fax: +86(0)1067392514

Email: yyan@bjut.edu.cn

_

Download English Version:

https://daneshyari.com/en/article/8148548

Download Persian Version:

https://daneshyari.com/article/8148548

Daneshyari.com