Accepted Manuscript

Revisiting the electrical and optical transmission properties of co-doped ZnO thin films as n-type TCOs

Arindam Mallick, Durga Basak

PII: S0079-6425(18)30034-3
DOI: https://doi.org/10.1016/j.pmatsci.2018.03.004
Reference: JPMS 504

To appear in: *Progress in Materials Science*

Received Date: 28 July 2017
Revised Date: 26 February 2018
Accepted Date: 14 March 2018

Please cite this article as: Mallick, A., Basak, D., Revisiting the electrical and optical transmission properties of co-doped ZnO thin films as n-type TCOs, *Progress in Materials Science* (2018), doi: https://doi.org/10.1016/j.pmatsci.2018.03.004

Revisiting the electrical and optical transmission properties of co-doped ZnO thin films as n-type TCOs

Arindam Mallick, Durga Basak*

Department of Solid State Physics

Indian Association for the Cultivation of Science

Jadavpur, Kolkata 700032, India

*Email: sspdb@iacs.res.in

Tel.: +91 33 2473 4971(Ext-1316)

Abstract

A transparent conducting oxide (TCOs) thin film exhibits a very high electrical conductivity and high visible light transparency with considerable practical applications in solar cells and in transparent electronics. As a promising substitute to Sn-doped In2O3 (ITO), doped ZnO thin films are widely considered due to low-cost, non-toxicity and high durability against the H plasma compared with ITO. In this review, by 'co-doping', we mean cation-cation (two iso-valent or heterovalent cations) and cation-anion (one higher valence cation and one lower valence anion) double doping in ZnO film. This article commences with a generalized description of TCOs, ITO and single-doped ZnO followed by a discussion on co-doped ZnO. We systemically present the current progress in both co-doping studies with critically summarized results to gain an overview, especially regarding the electrical properties. The cation-cation co-doping results in a wide range of carrier concentrations and resistivity values due to the competitive Zn site substitution by two different cations simultaneously. Cation-anion co-doping leads to an