# METAL DOPED ZnO STRUCTURES

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| **ABSTRACT**  Zinc oxide (ZnO) is one of the versatile and technologically interesting semiconducting materials because of its typical properties such as resistivity control over the range of 10−3–10−5 Ω.cm [1], transparency in the visible range, high electrochemical stability, direct band gap, absence of toxicity and abundance in nature [2]. ZnO normally occurs in the hexagonal wurtzite crystal structure with *a* = 0.32488 nm and *c* = 0.52066 nm in the standard data (JCPDS, 36-1451). High-purity ZnO crystals exhibit strong *n*-type conductivity and have both good electronic and optical properties because of a stoichiometric deviation due to the existence of intrinsic defects such as O vacancies and Zn interstitials. However, the electrical and optical properties of pure ZnO are unstable due to the adsorption of atmospheric oxygen, and they can not meet the increasing needs of present-day applications. To stabilize them against such changes and enhance the properties of the ZnO, doping is necessary and this purpose was achieved by adding some dopants [3,4]. Moreover, doping leads to an increase in the conductivity of ZnO. ZnO doping was achieved by replacing Zn2+ atoms with the atoms of the dopant elements. The efficiency of the dopant element depends on its electronegativity and the difference between its ionic radius and the ionic radius of zinc [5]. Extensive studies have been carried out to modify the properties of ZnO for different applications. This presentation focuses on the electrical and optical properties of different metal-doped ZnO powder and thin film materials.  **References:**  [1] Chu, S. Y., Yan, T. M., & Chen, S. L. (2000). Analysis of ZnO varistors prepared by the sol±gel method. Ceramics International, 26 (7), 733-737.  [2] Shinde, V. R., Gujar, T. P., Lokhande, C. D., Mane, R. S., & Han, S. H. (2006). Mn doped and undoped ZnO films: A comparative structural, optical and electrical properties study. Materials Chemistry and Physics, 96 (2), 326-330.  [3] Zeng, D. W., Xie, C. S., Zhu, B.L., B. L. Song, & Wang, H. (2003). Synthesis and characteristics of Sb-doped ZnO nanoparticles. Materials Science and Engineering B, 104 (1-2), 68–72.  [4] Maity, R., Kundoo, S., & Chattopadhyay, K. K. (2005). Electrical characterization and Poole–Frenkel effect in sol–gel derived ZnO:Al thin films. Solar Energy Materials & Solar Cells, 86 (2) 217–227.  [5] Nunes, P., Fortunato, E., Vilarinho, P., & Martins, R. (2002). Effect of different dopant elements on the properties of  ZnO thin film. Vacuum, 64 (3-4) 281–285. |

# Keywords: ZnO, Metal doping, Electrical conductivity, Optical properties.