Basics of Zinc oxide as a semiconductor: Theoretical explanation

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Abstract

Zinc oxide (ZnO) is a wide bandgap semiconductor and thus it has earned significant attention among the researcher in the last few years. It has versatile properties and potential applications in various electronic devices, such as high electron mobility, high thermal conductivity etc. It has large excitation binding energy and direct bandgap that make its unique characteristics. Consequently, it is very suitable for making a wide range device like transparent thin-film transistors, photodetectors, light emitting diodes and laser diodes that operates in the blue and UV region of spectrum. It is a cheap, transparent, conductive oxide and is used as a material for electronic circuits that is optically transparent for semiconductor spintronics and thus as an alternative to gallium nitride (GaN). This chapter firstly discusses the effect of defects and impurities on the electrical and optical properties of ZnO, secondly the practical applications of ZnO semiconductors in various fields such as nanotechnology, sensors, etc.