

# ZNO: AL NANOSTRUCTUR GAS SENSOR BY SPRAY PYROLYSIS

RAAD S. SABRY & DH AidAN KH. KAFI

Al-Mustansiriya University College of Science Physics Department, Iraq

## ABSTRACT

In this work, a study of Structural, electrical, optical and sensing properties are investigated of zinc oxide (ZnO) were deposited on cleaned glass substrates by chemical spray pyrolysis technique using ( $\text{ZnCl}_2$ ) as precursor solution. Also, aluminium-doped thin films of ZnO (AZO) were prepared by using ( $\text{AlCl}_3$ ) as doping solution for aluminium. The dopant concentration [Al/Zn atomic percentage (at%)] was varied from 0 to 3 at% in thin films of ZnO prepared in different depositions. The X-ray diffraction technique showed that all prepared films are polycrystalline with preferential orientation in the (002) direction, The peaks correspond to a hexagonal wurzite structure, the doping resulted in decreasing grain size i.e deteriorates the crystallinity of the films from (39.38nm) of pure ZnO to (30.22nm) 3% doped. The electrical properties showed the conductivity variation of Al-doped ZnO films with different doping concentrations increase with increased Al concentrations. Maximum electrical conductivity  $4.25 \text{ (S.cm}^{-1}\text{)}$  was obtained at a doping concentration of 3%. The films also exhibited distinct changes in their optical properties at different doping concentrations, including a decreasing of bandgap with increasing Al dopant concentration. The gas sensing results show that the sensitivity for detecting 750 ppm ethanol vapor was  $\sim 26.5$  and methanol vapor was  $\sim 20$  at an operating temperature of  $473^\circ\text{K}$ .

**KEYWORDS:** ZnO:Al, Gas Sensors, Nanostructures