Investigation of Nanostructured NiO and Au Doped NiO Thin Films by SPT

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Abstract

Nanostructured Nickel oxide (NiO) and NiO doped with 2% and 4% Au were prepared via spray pyrolysis technique (SPT). Structure, surface morphology, and optical properties were evaluated via XRD, AFM and UV-VIS spectrometer. Results indicate that all thin films polycrystalline and the peaks at $37.28°$ and $43.29°$ corresponding to (111), (200). The AFM image shows average diameter 73.5nm and average roughness 0.76 nm. Optical measurements show the band gap decrease with increase doping of Au thin films (2.88, 2.75 and 2.39) eV.

Key word: NiO, Au doping, XRD, Optical properties, AFM.

Introduction

Metal oxide films were used in many devices [1], like NiO, which have gap of 3.6 to 4.0 eV [2]. It can be used in gas sensors [3,4], anode in oxygen fuel cells [5], counter electrode in smart windows [6], reflectance mirrors [7–9]. NiO thin films was grown by many deposition methods, like PLD , thermal evaporation, spray pyrolysis, E- beam, dip coating, spin coating and electro deposition [10–23]. In recent years, many dopant materials was used to enhance sensitivity and sensing speed of gas sensors [24-28].In this study (SPT) was used to prepare NiO so as to study their physical characteristics .

Experimental

Thin films of NiO doped with Au were deposited using SPT. Solution containing 0.1 M of $(NiCl_2.6H_2O)$ with 100 ml of redistilled water The volumetric ratio of Gold Chloride dopant (supplied from sigma-Aldrich company) was 2% and 4%. The following optimizing