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Study the Electrical and Sensing Properties for Pure and Doped SnO₂ Films Prepared by Spray Pyrolysis Technique

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Abstract: The electrical and sensing properties for pure and doped SnO₂ with cobalt thin films was investigated. Nano particles of SnO₂ and SnO₂:Co thin films were prepared by spray pyrolysis technique at a substrate temperature of 400°C. The films deposited with 160 nm thickness. It has been measuring electrical properties such as the D.C conductivity, Hall effect and sensing properties for all thin films. The results showed that SnO₂ pure has conductivity about of $[18.842 \times 10^{-5} (\Omega \cdot \text{cm})^{-1}]$ at room temperature, and this conductivity increased with increasing of Co Vol.%, also, the results showed that all films have two activation energy and this activation energy decrease with increasing of Co Vol.%. From Hall effect measurements we find that R_H value is negative that mean the carrier is (n-type) and the majority charge are electrons. From the sensing measurements, the results of pure and doped SnO₂ thin films shows good sensors characteristics for (NO₂) gas and the maximum sensitivity for doped SnO₂ sensor when exposure to NO₂ gas is 82% for 2% doping with cobalt obtained for the film at operation temperature 200°C.

Keywords: Spray pyrolysis, Tin dioxide, Cobalt, electrical and sensing properties, activation energy, Hall effect, D. C. conductivity, sensitivity, response and recovery time, Thin film.

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