ABSTRACT

Zinc oxide (ZnO) is a material of interest for extensive research due to its numerous beneficial properties and wide range of applications. In this work, thin films of ZnO have been deposited by rf magnetron sputtering. The effect of varying thickness on the structural properties of the films have been studied. The crystallinity shows improvement with increasing thickness. The surface morphology is granular for all films and roughness increases with increasing thickness.

Nanorods of ZnO have been synthesized via hydrothermal route. It has been shown that the diameter of nanorods increases with increasing solution concentration and with increasing thickness of seed layer. However the diameter decreases with increasing roughness of the seed layers. The number density shows inverse behavior to that of diameter. The covered area and growth rates of nanorods were also estimated. Use of thick seed layers and higher solution concentration led to formation of film like array of nanorods covering almost the entire substrate surface. A new model has been proposed for the growth of ZnO nanorods. This model is based on the Avrami model and estimates the number density of nanorods as a function of solution concentration. To the best of the author's knowledge, Avrami equations have not been modified for nanostructures in terms of solution concentration.

Zinc Acetate, Sodium Dodecyl Sulfate and Trisodium Citrate have been used to modify the structure of nanorods. Each agent had a different influence on the structure evolution of ZnO nanostructures. The growth mechanism in the presence of these agents have been discussed in detail. Use of Sodium Dodecyl sulphate and Trisodium Citrate have shown potential for growth of continuous granular films via the simple and inexpensive hydrothermal method.