INVESTIGATION OF SNO_2 DOPED AL_2O_3 THIN FILM VIA ELECTROSPINNING WITH DIFFERENT ANNEALING TEMPERATURE

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ABSTRACT

Tin Oxide (SnO_2) is an n type semiconductor with direct band gap of 3.6eV. It is highly conducting, transparent and sensitive to gases. The energy band gap is one of the important parameter of SnO_2. This work was to characterize the optical properties of SnO_2 with different annealing temperature. The thin films of SnO_2 doped with Al_2O_3 was deposited by electrospinning method on the glass substrates. The thin films were annealed at 100°C, 200°C, 300°C, 400°C, 500°C then the optical and physical were investigated. Structural and morphological analysis were carried out by X-Ray Diffraction (XRD) measurement and Microscope. The optical characteristics were analyzed by UV-Vis Spectrophotometer. As annealing temperature increases, optical transmission increase too, this due to the increase in film homogeneity and degree of crystallinity of the film. The increase the temperature lead to decrease in absorption values.

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CHAPTER ONE
INTRODUCTION

1.1 Research Background

Semiconductors are one of the most interesting and most useful solids. They have been investigated many times because of their flexibility, electricity and optical features. SnO_2 is one of these semiconductors. Furthermore, SnO_2 has a large band gap of 3.6–4.0eV [1][2][3]. This wide band gap is suitable for solar cells or gas sensor [4][5][6]. It has unique electronic and optical properties [7][8]. Oxide semiconductors such as SnO_2 is representative the most used *n*-type semiconductor in gas sensing device materials for detecting trace concentrations [9]. One of the most important parameters of the semiconductors is their energy band gap. This parameter affects many of electrical and optical properties of semiconductors. The energy band gap will be changed according to changes in temperature, pressure and size of the particles. Therefor this parameter can show new properties of the semiconductor [10].

The thin film can be prepared by different deposition technique such as sol-gel-dip coatings, spray pyrolysis, pulse deposition and sputtering [11]. Electrospinning is the one of the deposition technique that usually used to fabricated the nanofiber [12]. Electrospinning has advantages that provide a simple and versatile method for producing nano fiber from a wide range of materials including polymers, composites and ceramics [13]. This method is cheap and it does not need any complicated instruments and homogeneous particles can be produced in this method.

Electrospinning is a manufacturing technique involving electrostatic driven process used to create electrospun fibers. Electrospinning is a very simple technique for the production of fibers ranging from sub-micron to nanometer [14][15]. In electrospinning, solid fiber is generated by continuous stretching of the electrified jet due to electrostatic repulsions between surface charges and solvent evaporation [13]. A solution that is formed at the end of a metal tip is highly electrified under the effect of a strong electrical field. To induce the formation of a liquid jet, this technique required high voltage.