EFFECTS OF MOLAR RATIO OF Zn:Sn ON THE PROPERTIES OF ZnO/SnO_2 HUMIDITY SENSOR

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ABSTRACT

In this research ZnO thin films prepared by rf magnetron sputtering and ZnO/SnO_2 cubic structure thin films developed by immersion method are reported. The effects of molar ratio Zn:Sn that varies from (1:10, 2:10, 3:10, 4:10) on the ZnO/SnO_2 thin films were characterized by using 2 probe I-V measurement (Keithley 2400) inside a humidity chamber (ESPEC SH-261) for electrical properties. The surface morphology of ZnO/SnO_2 thin films was characterized by using Field Emission Scanning Electron Microscopy (FESEM) (JEOL JSM 6701F). The parameter of molar ratio 4:10 shows high sensitivity and therefore is suitable for humidity sensor application. The size of cubic structure thin films decrease as the molar ratio of Zn:Sn increase.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Nanotechnology is the research and technology development at the molecular or macromolecular levels on the nanometer length scale (1-100 nm). Nanotechnology commonly categorized as either 'top-down' or 'bottom-up'. Nanotechnologies play several important roles in developing sensor technology. First, the ideal sensor will be minimally invasive and therefore as small as possible. This includes the power supply, the sensing action, whereby the detected property is converted into an electrical signal, and the transmission of the sensing signal to a remote detector. The second role for nanotechnologies will be in designing the sensing element to be as specific and accurate as possible; as the sensor dimension decreases the area of the sensor available to effect detection will also decrease, making increasing demands on sensitivity. Nanotechnologies are therefore expected to enable the production of smaller, cheaper sensors with increasing selectivity, which can be used in a wide range of applications [1].

The development of humidity sensor is increasingly in demand for research and application in technologies for environmental monitoring in both living and manufacturing spaces [2]. The criteria for a desirable humidity sensor include high sensitivity, long-term durability, fast response, low cost, and operation over a wide range of humidity and temperature [3]. So, the selection of a material should