IMPROVEMENT OF NANOCOMPOSITED ZnO/SnO_2 TOWARDS HUMIDITY SENSOR APPLICATION

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ABSTRACT

The study will be conducted on investigation of the improvement of nanocomposite ZnO/SnO_2 that has been prepared on ZnO coated glass using thermal chemical vapor deposition (CVD). The sensor properties were characterized by using current-voltage (I-V) measurement (Keithley 2400). The results analyzed were for ZnO nanoparticle, SnO_2 nanorod and ZnO/SnO_2 nanoflower like structure. The structural properties have been characterized using field emission scanning electron microscopy (FESEM) (JEOL JSM 6701F). The thins films were tested using two point probe and the sensor were characterized using I-V measurement (Keithley 2400) in a clean humidity chamber (ESPEC SH-261) and the chamber has been set at same room temperature (25 °C) with percent relative humidity (RH %) varied in the range of 40% to 90% RH. ZnO/SnO_2 nanoflower like structure performed highest sensitivity with 15 ratio compared to the ZnO nanoparticle and SnO_2 nanorod. The response and recovery time for ZnO/SnO_2 nanoflower like structure were 156s and 54 s respectively.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND RESEARCH

Nanotechnology shortened to “nanotech” is the study of the control of matter on an atomic and molecular scale. Generally nanotechnology deals with developing materials device or deal with structures of the size 100 nanometers or smaller in at least 1 dimension. Nanotechnology is very diverse, ranging from extensions of conventional device physics to completely new approaches based upon molecular self-assembly, from developing new materials with dimensions on the nanoscale to investigating whether we can directly control matter on the atomic scale. A nanostructure is an object of intermediate size between molecular and microscopic structures. The differentiation between the numbers of dimensions on the nanoscale is the way to described nanostructure.

Zinc oxide (ZnO) has a unique combination of properties of a semiconductor material with a significant fraction of ionic bonding. This material attracts much attention in current phosphor research, due to its superior optical and luminescent properties [1]. Zinc oxide is one of the most important group II–VI semiconductor materials. It is an n-type and a wide-band gap semiconductor with a direct energy gap of about 3.2 eV [2]. It is also included in a group of important transparent conducting oxides. ZnO is nontoxic and has high chemical and mechanical stabilities and high abundance in nature. ZnO also come from Wurtzite-structured semiconductor, owing to the non-centrosymmetric structure and suitable for piezoelectricity and pyroelectricity [3].