THE CHARACTERIZATION OF COPPER OXIDE (CUO) FOR DIFFERENT OXYGEN FLOW RATE DURING ANNEALING

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ABSTRACT

In this research, Copper oxide (CuO) was used as the thin films on quartz substrates. Copper oxide is a compound from the two elements copper and oxygen. Copper (II) oxide or cupric oxide (CuO) is the higher oxide of copper. As a mineral, it is known as tenorite. The purpose of this project is to study the effect of different oxygen flow rate during annealing of CuO thin films. The CuO solution was formed by sol gel method by mixing the copper (II) acetate Cu(CH3COO)2 with isopropanol, diethanolamine and polyethylene glycol. Spin coating technique was used to deposit thin film. Five samples of CuO thin films were annealed in different oxygen flow rate at 600 C for 1 hour. The characterization process was performed using Field Emission Scanning Electron Microscopy (FESEM) to check their surface topology and surface profiler to check their thickness. The electrical properties were measured using two probe techniques. The optical properties were measured using UV-Vis spectrometer. All samples shows different characteristics depends on their oxygen flow rate during annealing. Sample five with 35sccm (Standard Cubic Centimeters per Minute) show the highest response to current when the voltage was changed compared to the other samples.

In this research, the method used was sol gel method. The advantages of sol gel method are its ability to tune microstructure through sol gel chemistry and conformal deposition ability compared to other synthesis method.

Spin coating is one the technique that involve in sol-gel method in order to deposit thin film on the substrates.

The characteristics of all samples in difference oxygen flow rate during annealing, experimental methods used in achieving the result and recommendation is present in this paper.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

The cupric oxide (CuO) system has been researched for decades both for fundamental understanding and applied reasons to explore their potential application such as gas sensor [1], solar cells and photovoltaic, catalysts and magnetic storage media [2]. In device application, CuO was a good semiconductor material to be used because of it natural plenteous of starting material (Cu); low cost production processing; non-toxic nature; and reasonably good electrical and optical properties [3]. The usage of CuO is referred from their size and shape [4]. For this reason, the effect of different oxygen flow rate during annealing of copper oxide needs more investigation since it affected the size and shape of the thin films. There are several ways can be used to deposit thin film such as thermal oxidation, chemical conversion, chemical brightening, etching, spraying, chemical vapor deposition, plasma evaporation and reactive sputtering [5]. The crystal structure of CuO belongs to the monoclinic crystal system, with a crystallographic point group. It is obtain that there are coordination of oxygen around the copper. The copper atom is coordinated by 4 oxygen atoms in an approximately square planar configuration.

The sol gel spin coating technique had been used through this research, that were low cost method and simple method with efficient performance to formed copper oxide solution [6]. To this purpose, the sol gel technique served an outstanding role as a soft bottom-up approach to reach a good control over film composition and microstructure.