THE PROPERTIES OF P-TYPE NANOSTRUCTURED COPPER (I) IODIDE (CuI) THIN FILMS PREPARED BY A NOVEL MISTER ATOMIZER TECHNIQUE FOR DYE-SENSITIZED SOLAR CELL (DSSC) APPLICATION

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ABSTRACT

In this research, the nanostructured CuI thin film for the solid state dye-sensitized solar cells (SSDSSC) was produced by a spraying method which uses mister atomizer. The 0.05 mol of CuI solution was prepared at room temperature by mixing the CuI power with 50ml acetonitrile as solvent and doped with iodine. The CuI concentration was varied from 1 at % (atomic percent) until 5 at % of the iodine doping. Then the CuI thin films were deposited on a glass substrate. The electrical properties of CuI thin films were studied using current – voltage (I-V) solar simulator (CEP 2000) and the thickness of CuI thin films were measured using surface profile (VEECO DEKTAK 150). Then metal contacts have been deposited using sputter coater (EMITECH K550X). The best conductivity of the CuI thin film is at 4at% which is 6.94×10^{-1} S.cm in dark and 6.98×10^{-1} S.cm in illumination since it has less resistivity. The optical properties of CuI thin films were investigated by JASCO UV-VIS/NIR spectrophotometer. The result of the transmittance spectra is at high transparency which is at 71% - 90% nm. Then the surface morphology of the CuI thin films were characterized using field-emission scanning electron microscope (FESEM). The FESEM images show the CuI thin films were in nanoparticle size. The particle size evaluated from FESEM was at 25nm to 90 nm range. The electrical properties, optical properties and surface morphology of CuI thin film could be affected by changing the atomic percent (at%) of the doping concentration of iodine.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Nanotechnology had become one of the most active research fields in recent years. Nanotechnology shortened to "nanotech" is the study of the control of matter on an atomic and molecular scale. Generally, nanotechnology deals with developing materials devices or deal with structures of the size 100 nanometres or smaller in at least 1 dimension. A nanostructure is an object of intermediate size between molecular and microscopic structures. The differentiation between the numbers of dimension on the nanoscale is the way to described nanostructure.

A solar cell also known as photovoltaic cell or photoelectric cell. In the solar cell the energy of light directly convert into electricity by the photovoltaic effect. The solar cells are used for powering small devices such as in electronic for example electronic calculators. The photovoltaic device is based on the concept of charge separation at an interface of two material of different conduction mechanism[1]. The dye-sensitized solar cells (DSSC) provide a technically and economically credible alternative concept to present the p-n junction photovoltaic devices.

DSSC is based on a semiconductor formed between a photo-sensitized anode and an electrolyte, a photoelectrochemical system. These cells were invented by Michael Grätzel and Brian O'Regan and are also known as Grätzel cells [1]. A DSSC is a low-cost solar cell belonging to the group of thin film solar cell.