

**PHOTOCONDUCTIVITY OF P-TYPE SEMICONDUCTING NANOSTRUCTURED  
COPPER (I) IODIDE (CuI) THIN FILMS**

This project report is presented in partial fulfillment for the award of the

*Bachelor of Engineering (Hons.) Electrical*

*Of*

**UNIVERSITI TEKNOLOGI MARA**



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**MAY 2010**

## ACKNOWLEDGEMENTS

First and foremost, I would like to thank my research supervisor, Assoc. Prof Dr. Mohamad Rusop for his advice, encouragement and guidance throughout the research. This project would not have been possible without his excellent supervision. My special thanks also go to my co-supervisor, En. Uzer Bin Mohd Noor for his support and encouragement in completing this research.

I gratefully acknowledge all the senior students in the Solar Cell Laboratory; En Ayib Rosdi (PhD student), Pn. Puteri Sarah (PhD student), En. Musa (Msc. student), En. Hafiz (PhD student), Pn. Asiah (PhD student), Pn. Suriani (PhD student) and Pn. Salina (PhD student) for their technical advices. I also would like to thank NANO-SciTech Centre and Solar Cell laboratory technicians, Mr. Azlan and Mr. Suhaimi for their assistance in the lab. Many thanks also for En. Hayub and Pn. Nurul for their helps to complete this research.

Last but not least, I would like to express my deepest thanks to my family members and friends for their love, encouragement, understanding, and support during the entire research period.

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## ABSTRACT

The work presented here shows the effect of annealing temperature on CuI thin films. The CuI materials in thin film structure have been synthesized using the sol-gel method. The method used for thin film deposition was spin coating technique on glass and silicon substrates. Glass substrate is used for the purpose of characterization for electrical and optical properties. While for silicon substrates is used for structural properties characterization. The electrical, optical properties and surface morphology was characterized by Field Emission Scanning Electron Microscopy (FESEM), atomic force microscopy (AFM), UV-Vis-NIR measurement and two point probe I-V measurement. For the structural properties, FESEM images reveal noticeable transformation in film morphology among the films fabricated at various annealing temperatures. The nanostructured CuI thin films can be seen through AFM measurement. Next for optical properties, the study is concentrated on its transmittance, absorption coefficient and optical band gap. The CuI thin films exhibited an optical transmittance of 47%-80% at various annealing temperature in the wavelength of 400-800nm. The purpose for I-V measurement is to study its resistivity and conductivity. The I-V measurement in dark indicates that the resistivity decreases until the sintering temperature is  $\sim 100^{\circ}\text{C}$ . However, the resistivity of CuI under illumination is increasing since CuI tends to be oxidized under continuous illumination.

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# CHAPTER 1

## INTRODUCTION

### 1.1 SIGNIFICANCE OF SOLAR CELLS

Nowadays, global energy issues have reached unprecedented levels of significance both for nations and for the consuming public. The earth is suffering from our lackadaisical of Mother Nature. Natural resources facing a rapid depletion lead to worldwide socioeconomic chaos.

Fossil fuels remain the dominant sources of energy worldwide, accounting for 77% of the demand increase in 2007-2030. Although oil demand is expected to drop by 2.2% in 2009 as a whole, following a drop of 0.2% in 2008, it is projected to recover from 2010 as the world economy pulls out of recession, rising from around 85 million barrels per day in 2008 to 105 mb/d in 2030, an increase of around 24%. In 2007-2030, demand for coal grows by 53% and demand for natural gas by 42% [1].

Therefore, to cope with this problem, renewable energy technologies is used such as wind turbines, hydropower, wave and tidal power, solar cells, solar thermal, biomass- derived liquid fuels and biomass- fired electricity generation. However, among of all these renewable energy, photovoltaic technology utilizing solar energy is the most promising one.

Today the world uses about 13 TW of power. By 2050, projection about 30 TW will be needed. The sun serves as a renewable and nonpolluting source of energy. More than 120,000 TW of power from the sun is incident on the earth [2]. Therefore solar cells is used to utilize all the energy from the sun by converting solar radiation