ELECTRICAL PROPERTIES OF AMORPHOUS CARBON THIN FILMS DEPOSITED BY BIAS ASSISTED PYROLYSIS-CVD

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ABSTRACT

This thesis investigates the electrical properties of amorphous carbon thin films by varying the different temperature and was deposited on the glass substrates by using bias-assisted pyrolysis-CVD. The amorphous carbon thin films were characterized by using Current-Voltage (I-V) measurement in dark and under illumination, UV-Vis/NIR Spectrophotometer and Atomic Force Microscopy (AFM). The electrical properties measurements in dark and under illumination show that, the resistivity decreases from $2.22 \times 10^{8} \Omega.cm$ to $4.32 \times 10^{7} \Omega.cm$ and conductivity increases from $4.51 \times 10^{-9} S.cm^{-1}$ to $2.32 \times 10^{-8} S.cm^{-1}$ when the temperature increases from 250 to 550°C. While the optical properties measurements shows the high absorption coefficient at the highest temperature, 550°C. The surface morphology images also shows that the amorphous carbon thin films particles uniformly shaped from $3.63 \mu m^2$ to $0.75 \mu m^2$.

Keywords: Amorphous Carbon; Thin Films; Current-Voltage Measurement; Absorption Coefficient; Surface Morphology

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW OF PROJECT

Photovoltaic solar cells are one of the most viable technologies for the future which have been elevated human life for a decade into a level that never imagined before. For a decade, photovoltaic solar cells are mainly fabricated using silicon material and compound semiconductor which dominated the market share [1-3]. Basically, photovoltaic solar cells are fabricated using different type of materials which offer different efficiencies. Some of commercialize materials available in the market are from single crystalline silicon, polycrystalline silicon, amorphous silicon and compound semiconductor [10-13]. They were reported as an economically expensive in commercialization basis cost comparing with other materials solar cell [9].

Accordingly, amorphous silicon was introduced in minimizing the use of bulk silicon. More importantly, it has higher absorption coefficient thereby more photon energy from spectrum of light would be absorbed; however, it has brought a short degradation lifetime of excited free carriers when exposed under light illumination [14].

Carbon is a good candidate for an alternatively material in replacement the remarkable silicon in the futuredue to the abundantly in nature and suitability as a precursor. At present, carbon has been used in many applications in different areas of human activity including wear resistant coating, nano-electronics and