INFLUENCE OF DEPOSITION TEMPERATURE ON ELECTRICAL AND OPTICAL PROPERTIES OF BORON DOPED AMORPHOUS CARBON THIN FILMS BY POSITIVE BIAS- ASSISTED PYROLYSIS-CVD

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ABSTRACT

Boron-doped amorphous carbon thin films were deposited on glass substrates by positive bias-assisted pyrolysis-CVD at various deposition temperatures in the range of 200^{o}C-350^{o}C and characterize the electrical properties of deposition structured a-C thin film. The electrical, optical and structural properties were characterized by using current voltage (I-V) measurement, UV-VIS/NIR spectrophotometer and Atomic Force Microscopy (AFM). The electrical conductivity of amorphous carbon thin films increased as the temperature increased. The highest and lowest photo responses were found at 300^{o}C. The resistivity is lower and thus gives the conductivity of a-C thin films increased due to the relation between the resistivity and conductivity are inversely proportional. These results show that there is the possibility to improve the electrical for the application of solar cell.

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CHAPTER 1

INTRODUCTION

For a decade, photovoltaic solar cells are mainly fabricated using silicon material and compound semiconductor which dominated the market share [1-3]. Accordingly, allotropes carbons as reported will be promised as a potential candidate for an alternative material in the future due to the abundantly in nature, suitability as a precursor, excellent photoconductivity and high optical absorption of visible light, can be deposited on any inexpensive substrate [2-4].

Carbon is a good candidate for an alternatively materials in replacement the remarkable silicon in the future due to the abundantly in nature and suitability as a nature precursor [4-6]. Carbon is found of having a wide band gap and can be tuned from 0.5eV to 5.5eV tailoring with energy band gap of photon by using different type of parameters such as deposition temperature, argon flow rate, annealing temperature, etc [7-9].

A lot of researches have been done in a past few years in amorphous carbon (a-C), hydrogenated amorphous carbon (a-C:H) and nitrogenated amorphous carbon (a-C:N) thin films because of their popular properties such as highly stable, cheap and nontoxic which can be obtained from precursors those are sufficiently available in nature [4-6]. The Apart from that, a-C thin films can be used in device applications since it has a high hardness, high electrical resistivity, high thermal conductivity, high dielectric strength, infrared transparency and anti-reflecting films [4,5,6].