PROPERTIES OF IODINE DOPING IN AMORPHOUS CARBON THIN FILMS GROWN BY CHEMICAL VAPOR DEPOSITION (CVD) METHOD

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ABSTRACT

The amorphous carbon (a-C) thin film was deposited by thermal chemical vapor deposition (CVD) technique as the most economical method that using argon (Ar) as carrier gas. The influence of iodine doping on the properties of electrical, optical, and structural for amorphous carbon (a-C) thin films that deposited on glass and quartz substrate at deposition temperature ranging from 500 °C to 700 °C were reported. In this work, the iodine doping process is introduced for alteration of undoped a-C thin film as it has shortage in properties. The films were characterized by Perkin Elmer (LAMBDA 750) UV/VIS/NIR spectrophotometer for optical properties, BUKOH KEIKI (CEP200) Solar Simulator for electrical properties, while Raman spectroscope HORIBA Jobin Yvon (HR800) and Atomic force microscopy (AFM) were used for structural properties. From the characterization of electrical properties, the I-V measurement revealed that I-doping increased the conductivity as the temperature increased. The optical band gap decreased from 0.60 eV to 0.15 eV for iodine doped of the thin films. The Raman spectral result shows that graphitization of the films intensified after iodine doping introduced. The surface morphology of the thin films indicates the roughness of the thin films decreased as the deposition temperature increased.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

The solar cell or photovoltaic cell is a device that generates electricity directly from sun or visible light through the photovoltaic effect. The commonest solar cells by far are produced by semiconductor materials such as silicon (Si). Much of today researches in solar cell focus on materials which have ability to recover the deficiency of silicon such as carbon (C). The element carbon (C) is used to produce amorphous thin films for solar cells as it is an attractiveness element that can be distinguished in the forms ranging from insulator diamond to metallic graphite to semiconducting nanotubes [1,2]. Carbon is said has certain prominent properties such as high electrical resistivity, high thermal conductivity, high dielectric strength, and high hardness [3]. Camphor oil ($C_{10}H_{16}O$) was used as precursor as it act as the natural source of carbon that available in nature, which is a material of highly stable, cheap and non-toxic.

Carbon is materials that commonly in the form of soot, carbon fiber, and evaporated carbon as it one of the attractive semiconductor element because of its semiconducting nature [5, 11]. The deposition by pyrolysis process of the evaporation of camphor oil as source of carbon has created the amorphous carbon (a-C) thin film on the substrate.