Properties of Amorphous Carbon Thin Films for Solar Cell Application

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ABSTRACT

This thesis is presented the research on properties of amorphous carbon (a-C) thin films for solar cell application. Amorphous carbon thin films have been deposited on silicon substrate by thermal chemical vapor deposition (Thermal-CVD) method at various deposition temperatures. The surface morphology and electrical properties of these films have been studied using Scanning Electron Mircoscope (SEM) and Current Voltage (I-V) Measurement (Advantest R6243 DC Voltage Current Source/Monitor Software), respectively. It was found that increasing deposition temperature had the most influence on the a-C thin films properties. In addition the carrier gas flow and catalyst concentration both showed a secondary impact on the properties of a-C thin films. The resistivity of a-C thin films decreases when the deposition temperature increases. However, at higher deposition temperature the conductivity increases due to the formation of more disorder sp^2 carbon site.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Amorphous carbon (a-C) thin films have been made by a variety of techniques such as thermal chemical vapor deposition (thermal CVD), electron gun evaporation, sputter deposition, cathodic arc deposition and pulsed laser deposition [1]. Among the different methods for the preparation of a-C thin films, thermal CVD method has many advantages such as an economical in production, since many parts can be deposited at the same time.

Recently, a-C thin films are use as an alternative material in solar cell application to replace the dominant material which is silicon. Carbon has many advantages compare to silicon such as high thermal conductivity, high electrical resistivity, high dielectric strength and high hardness [2]. These properties are suitable for solar cell application. Unfortunately, the efficiency of a-C thin films is lower comparing to silicon for solar cell application. However, by focusing of cost per performance, a-C thin films more efficient compared to silicon.