CHARACTERIZATION ON A-SiC THIN FILM BY X-RAY DIFFRACTION,RAMAN SPECTROSCOPY AND INFRARED RADIATION SPECTROSCOPY

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TABLE OF CONTENTS

		Page
ACKNOWLWGMENTS		**ii**
TABLE OF CONTENTS		**iv**
LIST OF TABLE		**vi**
LIST OF FIGURE		**vii**
LIST OF ABBREVIATIONS		**x**
ABSTRACT		**xi**
ABSTRAK		**xii**
CHAPTER 1 INTRODUCTION		
1.1	Background	**1**
1.2	Significance Of Study	**2**
1.3	Objectives Of Study	**3**
CHAPTER 2 LITERATURE REVIEW		
2.1	Introduction	**4**
2.2	Material Properties	**8**
2.3	Characterization	**11**
2.3.1	Raman Spectroscopy	**12**
2.3.2	X-Ray Diffraction (XRD)	**18**
2.3.3	Fourier Transform Infrared Spectroscopy (FTIR)	**23**
CHAPTER 3 METHODOLOGY		
3.1	Material	**27**
3.1.1	Raw Material	**27**
3.1.2	Chemicals	**27**
3.1.3	Apparatus	**27**
3.2	Flow Of Work	**30**
3.3	The Deposition System	**31**
3.4	Sample Preparation	**31**
3.5	Annealing Process	**32**
3.6	Characterization	**34**
CHAPTER 4 RESULT AND DISCUSSION		**35**

ABSTRACT

In this research, silicon carbide thin films were initially deposited by a home-build HW chemical vapors deposition (CVD) system at low temperatures 250 °C and deposition rates of 0.12 cm/s. The specific problem statement in this study is to enhance the structural properties of a-SiC thin film through annealing process. In order to study the effects of annealing on the structural properties of a-SiC thin film, it was annealed from 100 °C to 400 °C. Studies were done through characterizations by using the X-ray diffraction spectrum (XRD), Raman spectroscopy and also the Fourier Transform Infrared Radiation (FTIR). The analysis through XRD shows the crystallite size of a-SiC had increased due to increasing annealing temperature. From Raman spectroscopy analysis, it was found that the annealing temperature between 100 °C to 400 °C does not affect the carbon compound in the thin film. Lastly, FTIR analysis shows changes only occur at the first anneal temperature which is at 200 °C. After that there is no change in crystallite structure when anneal at 300°C until 400°C. This is because the compound of Si is stretched resulting in increased crystallite size.

CHAPTER 1

INTRODUCTION

1.1 Background

Silicon is a four-fold coordinate which is normally tetrahedral bonded to four neighboring silicon atom. Amorphous silicon (a-Si or α-Si) is the non-crystalline allotropic form of silicon. It can be deposited in thin films at low temperatures onto a variety of substrates, which offers some unique capabilities in a variety of electronics. Amorphous silicon has become the material of choice for the active layer in thin-film transistors (TFTs), which are most widely used in large-area electronics applications, mainly for liquid-crystal displays (LCDs).

Silicon carbide (SiC), is a compound of silicon and carbon with a chemical formula SiC. Silicon carbide is an important material for potential application in high temperature semiconducting devices, hard ware resistant coatings and protective barrier for corrosion or thermal oxidation and photo electronics. Silicon carbide has unique properties such as wide band gap, high electron mobility, high thermal conductivity and high melting point.