FOURIER TRANSFORM INFRA-RED (FTIR) PROPERTIES OF CARBON NANOTUBES PREPARED FROM CAMPHOR OIL BY THERMAL CHEMICAL VAPOR DEPOSITION

SITI NAZIRAH ABU BAKAR

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ABSTRACT

FOURIER TRANSFORM INFRA RED PROPERTIES OF CARBON NANOTUBES PREPARED FROM CAMPHOR OIL BY THERMAL CHEMICAL VAPOR DEPOSITION

Effective and economical methods to produce carbon nanotubes are necessary for future technology as well as the development of nano-size devices. Limited progress has been reported in producing carbon nanotubes. In this study, carbon nanotubes have been produced using Thermal Chemical Vapor Deposition (TCVD) method from camphor oil, $C_{10}H_{16}O$. Catalyst which nickel (II) nitrate hexahydrate, Ni $(NO_3)_2.6H_2O$ was dispersed onto silicon substrate using spin coater. The silicon substrate was heated at high temperature and the camphor oil was vaporized in duo-furnaces CVD. The effect of different deposition temperature onto carbon nanotubes grown was investigated. Fourier Transform Infra-Red (FTIR) spectra were recorded to characterize the chemical properties. The grown carbon nanotubes also characterized using Field Emission Scanning Electron Microscope (FESEM) to observe the structure and uniformity. The FTIR spectra show the deposition temperature affect the quantity of carbon nanotubes grown interpreted from the intensity of peak and from this research, the optimum temperature to produce the CNTs is 700°C. This was confirmed by FESEM images. The images also show the majority of carbon nanotubes produced has smooth surface.

CHAPTER 1

INTRODUCTION

1.1 Background and problem statement

Carbon nanotubes (CNTs) are allotropes of carbon (allotropes are carbon atoms that have same arrangement in bonding but have different physical structures and properties) with unique properties such as electrical, mechanical, optical, thermal, and chemical properties. It is including into fullerene structural family (Grace, 2003) (fullerene is a class of carbon molecules which consists of hexagons and pentagons that form a spherical shape). This unique properties make them potentially useful in many applications in nanotechnology, electronics, optics and other fields of materials science, including archaeology and architectural.

Individual CNTs can conduct electricity better than copper, possess higher tensile strength than steel, and conduct heat better than diamond. In electronic applications, CNTs can possess higher mobilities than single crystal silicon. All this in a material that is over 10,000 times thinner than a human hair.

There are two types of CNTs which are Single Wall Nanotubes (SWNTs) and Multi Wall Nanotubes (MWNTs) which performs different characteristics.

CNTs can be produced by several methods. They are arc discharge, laser ablation, Chemical Vapour Deposition (CVD) (Daenen, 2003) and the latest method, by using mister atomizer. Instead of that, this study also investigates properties of CNTs produced by using Fourier Transmission Infra-Red (FTIR) from camphor oil.