

**THE SYNTHESIS AND OPTIMIZATION OF CARBON NANOTUBES  
ON POROUS SILICON NANOSTRUCTURES**

**NOOR SYUHaida BT IBRAHIM**

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## ABSTRACT

### THE SYNTHESIS AND OPTIMIZATION OF CARBON NANOTUBES ON POROUS SILICON NANOSTRUCTURES

Carbon Nanotubes (CNTs) were successfully synthesized on porous silicon (PSi) nanostructures using Thermal Chemical Vapor Deposition (TCVD) method. The PSi nanostructures were obtained using photo-chemical anodization method by varying the current density parameter of Porous Silicon. To synthesis the CNTs on PSi nanostructures, camphor oil is used as precursor and ferrocene as catalyst by keep the temperature constant at 800°C and deposition time at 15 minutes. The surface morphology of PSi and CNTs were studied using Field Emission Scanning Electron Microscope (FESEM) while Raman spectroscopy was carried out to study the degree of cristanility of graphitization of CNTs. From AFM results, it can be showed that roughness at 0.120 nm is the optimum for the porous silicon nanostructures which is at 20 mA/cm<sup>2</sup>. While Raman Spectroscopy gives the I<sub>D</sub>/I<sub>G</sub> ratio. The lowest value of I<sub>D</sub>/I<sub>G</sub> ratio is 0.869 which is the optimum CNTs produced at 20 mA/cm<sup>2</sup> of current density is represented by sample (c).

# CHAPTER ONE

## INTRODUCTION

### 1.1 Introduction

The term of nanotechnology were first used by the late Norio Taniguchi which refers to the ability of materials engineer precisely at the scale of nanometer. This is in fact the current meaning that to comprise the design, characterization, production and application of materials. Nowadays, the scope has been widened which include the devices and system rather than just materials. Thus, the term of nanotechnology is defined as the design and fabrication of materials, devise and systems with control at nanometer dimensions and scales.

In this review, I will present a condensed and brief method to produce nanotubes on substrate of porous silicon nanostructures. To synthesis and optimized the nanotubes, the porous silicon was prepared using photo-electrochemical anodization by varying the current density during anodization process and the nanotubes was deposited on the substrate using thermal chemical vapour deposition method. Nowadays, this technique is a promising approach to integrate nanotubes into electronic devices and structural systems. The ferrocene was used as a catalyst and the the camphor oil was the source of carbon