Parameter optimization of CNT production using Sri Lankan graphite by arc discharge method

Rathnayake Mudiyanselage Sunanda Jayalath Gunasekara (R. M. S. J. Gunasekara)

(09/8110)

Degree of Master of Philosophy



Department of Electrical Engineering

University of Moratuwa

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DECLARATION

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Date:

Dr. Lilantha Samaranayake

Supervisor

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R. M. Sunanda Jayalath Gunasekara

ABSTRACT

Since their discovery in 1991 by Iijima, carbon nanotubes have been of great

interest. The key advantages of these structures are their electronic, mechanical,

optical and chemical characteristics, which open a way to a variety of applications.

These properties can even be measured on single nanotubes. For commercial

application, large quantities of purified nanotubes are needed.

Different types of carbon nanotubes can be produced in various ways. The most

common techniques used nowadays are: arc discharge, laser ablation, chemical vapor

deposition and flame synthesis.

Fundamental and practical nanotube researches have shown possible

applications in the fields of energy storage, molecular electronics, nano-mechanical

devices, and composite materials. Real applications are still under development.

This project is basically focused on arc discharge method of CNT production using

Sri Lankan vein graphite. Sri Lankan graphite is unique due to its perfect crystalline

structure and the higher as mined purity compared with that of commonly available

flake graphite. This type of natural resource is found mainly in Sri Lanka. Detailed

study on flake and vein graphite was carried out in this study as one of its objectives.

Also SEM and TGA analysis of the multiwall carbon nanotubes are discussed.

Special technique for comparing diameters of multiwall wall carbon nanotube was

developed by using TGA. Further, the cross section analysis was carried out for the

arc scoot to analyze the formation of the nanotubes on the cathode. Another objective

here was to identify the optimum parameters for the production of CNT using the arc

discharge method. Arcing time, current, chamber inert gas, chamber pressure and the

type of the electrode were the variables. Arcing current around 100 A, pressure

around 700~900Torr and arcing duration around 60s with helium as the inert gas

were the optimize conditions.

Key words: Vein Graphite, CNT, MWCNT, Arc discharge, Nanotube

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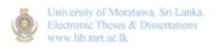
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LIST OF ABBREVIATIONS

Abbreviation	Description
Å	Angstrom
AFM	Atomic Force Microscope
Ar	Argon
CNT	Carbon nanotube
EDX	Energy Dispersive X-ray analysis
FTIR	Fourier Transform Infrared Spectroscopy
g	gram
kg	kilogram
kV	Kilo Volts
MWCNT	Multi wall carbon nanotube
SEM	Scanning Electron Microscope
SWCNT	Single wall carbon nanotube
TGA	Thermo Gravimetric Analysis
CVD	Chemical Vapor deposition
DC	U Direct current a Sri Lanka
USA	United States of America
DWCNT	Double wall carbon nanotube
VPGCF	Vapor phase grown carbon fibers