# Synthesis of Carbon Nanoparticles by using Seed Oils and Evaluation of Their Biological Applications


**By:**

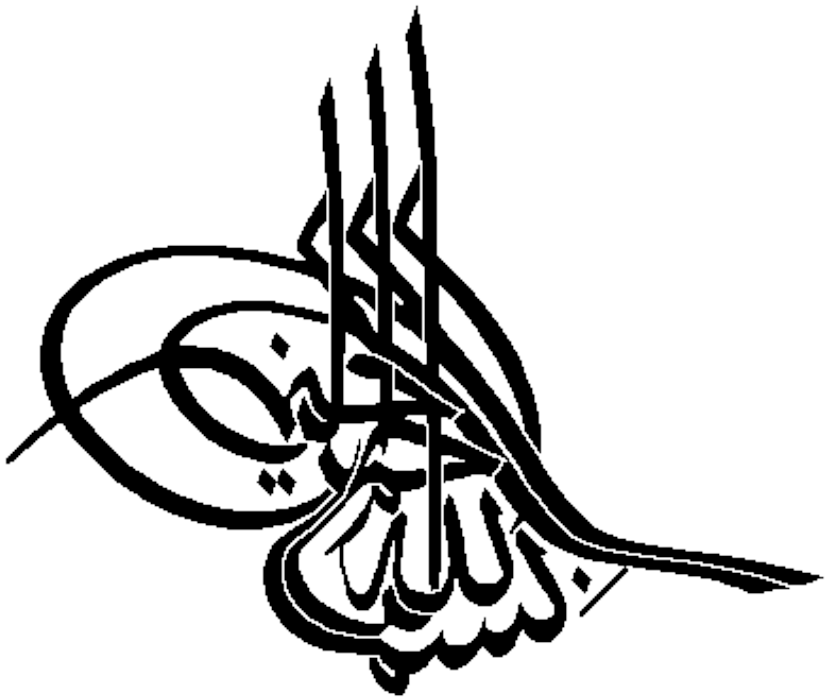
**MUHAMMAD SALMAN MUHSAN**

**ID: 13001140014**

**SUPERVISOR:**

**DR. SOHAIL NADEEM**

**DEPARTMENT OF CHEMISTRY**
**SCHOOL OF SCIENCE**
**UNIVERSITY OF MANAGEMENT AND TECHNOLOGY,**
**LAHORE, PAKISTAN 2015**



*In the name of*

# *Allah,*

*The most Compassionate,*

*The most merciful*

# DECLARATION

I **MUHAMMAD SLAMAN MUHSAN** S/O **MUHAMMAD SADDIQUE** ID: **13001140014**, Session **2013-2015** hereby declare that the matter printed in the thesis titled ***"SYNTHESIS OF CARBON NANOPARTICLES BY USING SEED OILS AND EVALUATION OF THEIR BIOLOGICAL APPLICATIONS"*** is my own work and has not been printed, published and submitted as research work, thesis or publication in any form in any University, Research institution etc. in Pakistan or Abroad.

*Dated:* _____ _____

***(MUHAMMAD SALMAN MUHSAN)***

# RESEARCH COMPLETION CERTIFICATE

Certified that the research work contained in this thesis titled, ***"SYNTHESIS OF CARBON NANOPARTICLES BY USING SEED OILS AND EVALUATION OF THEIR BIOLOGICAL APPLICATIONS"*** has been carried out and completed by **MUHAMMAD SALMAN MUHSAN, ID: 13001140014**. The quantum and the quality of the work contained in this thesis is adequate for the award of Degree of MS/M.Phil.

**Supervisor**
**Dr. Sohail Nadeem**
Asst. Professor
Department of Chemistry
UMT, Lahore.

**External Examiner**

**Dr. Sammia Shahid**
**Chairperson,**
Department of Chemistry,
UMT, Lahore.

**Dr Muhammad Azhar Iqbal**
**Dean**
School of Science,
UMT, Lahore.

# Dedication

This research work is
**Dedicated to**

**MY HOMELAND "PAKISTAN"**
My real paradise

**MY SACRIFICIAL PARENTS AND SISTERS**
Who always pray for my success and sacrifice for me

**MY SINCERE FRIENDS**
**SANAULLAH SAQI**
**AND**
**IMRAN LATIF**
Who always stands with me in any situation

**&**

**MY TIMELESS INSTITUTION**
**"UMT LAHORE"**
That provided me chances to explore new ideas

# ACKNOWLEDGEMENT

All praise and glory is for **"ALMIGHTY ALLAH"** whose uniqueness and wholeness is unchallengeable, where blessings and exaltation flourished my thoughts, enabled me to contribute to the sacred wealth of knowledge. ALLAH has always given me the way to come out from any difficulty whenever I find no way. Chariest blessings and salutation on **"HAZRAT MUHAMMAD"** (Peace Be Upon Him and His Family) who is forever a tower and torch of knowledge and guidance to humanity and who gave us the way to lead our life in a content and perfect manner.

This Study was conducted under the able guidance of very nice, greatest and helpful research supervisor **"Dr Sohail Nadeem"**. I am really thankful for his illustrious encouragement and sympathetic attitude during accomplishment of my thesis. I would also like to thank **Prof. Dr. Sammia Shahid** Chairperson, Department of Chemistry, School of Sciences, University of Management and Technology, Lahore in regular sharing of ideas and support in my research. I am very thankful to **Dr Muhammad Azhar Iqbal** Dean of School of Sciences, University of Management and Technology, Lahore. Special thanks to my beloved teachers, especially **Dr. Ayesha Mohy ud Din** for his kind attitude and consistent moral support.

I am grateful to **Mr. Asim Ali** Assistant HR Manager CIIT Lahore campus for his cooperation to get access to IRCBM Lahore. I am very grateful to **Dr. Aqif Anwar** Head of department of IRCBM CIIT Lahore campus and **Dr. Touseef Ahmed** in "Center for advanced studies in physics" (CASP) of Govt. College University Lahore for lending his help in SEM analysis. I want to thank **Mr. Fawad** of Chemical engineering department CIIT Lahore and **Mr. Ali Hussnain** in physics department of Govt. College University Lahore for being a very supportive in powder XRD analysis of carbon nanoparticles.

Special appreciation is offered to my **sisters** who always supported me in every field of life and encouraged me to do difficult tasks. I want to thank my Brother like friend **Mr. Sanaullah Saqi** for his continuous support in all fields of my life, who become a source from ALLAH to start my Studies. I want to thank my sincere friend **Mr. Imran Latif** who introduced me the line "Improve Yourself" and criticized on my decisions positively and especially supported me in my M.S studies by many ways. I want to thank my classmates particularly **Abrar ul Hassan** for contributing and supporting me in the crucial periods which I faced during the completion of M.S.

I present my heartfelt gratitude to my loving parents and teachers especially **Dr. Shazia Khursheed** Chemistry department GCU Lahore who supervised me in my first research project in my life. In all these gratitude I cannot finish without acknowledging the cooperatiotion of my **all staff members** (especially Mr. Sanaullah (Sr. Headmaster), Mr. Irfan ul haq, Mr. Nafees Sadiq, Mr. M. Akram, Mr. Farooq and Mr. Ali Ahmad) of GHS 111/EB Arifwala, without their cooperation I cannot complete my theory as well as research work.

***Muhammad Salman Muhsan***

# ABSTRACT

Synthesis of carbon nanoparticles was carried out by using different seed oils (mustard, olive, linseed, castor, almond, eucalyptus and cardamom oils). Simple combustion technique was applied and it was as efficient as other methods such as laser ablation, chemical vapor deposition, arc discharge. Nano particles of Carbon having nano range were synthesized by using the above stated oils by the help of this simplistic and inexpensive technique. The characterization was done by powder Thermo Gravimetric analysis (TGA), X-Ray Diffraction (XRD), Differential Scanning Calorimetry (DSC), Scanning Electron Microscope (SEM) and Fourier Transform Infra-Red spectroscopy (FTIR). The average size of carbon nanoparticles by using mustard oil, olive oil, linseed oil, almond oil, eucalyptus oil, lemon oil and cardamom oil was observed that was 18 nm, 24nm, 57nm, 3.46nm, 3.042nm, 4.69nm and 4.70nm respectively.as explored by using powder X-Ray Diffraction technique. Surface morphology of these synthesized carbon nanostructures was predicted by the help of scanning electron microscopy technique. The screening of these produced carbon nanoparticles was done for antibacterial activities against different species (*e.g.* Staphylococcus aureus, Streptococcus haemolyticus, Pseudomonas aeruginosa and Proteus refrigere) and productive results were obtained.

# CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

# LIST OF ABBREVIATIONS

| | |
|---|---|
| **SEM** | Scanning Electron Microscopy |
| **TGA** | Thermo gravimetric Analysis |
| **FTIR** | Fourier Transform Infrared Spectroscopy |
| **TEM** | Transmission Electron Microscopy |
| **BET** | Brunauer, Emmett and Teller |
| **SWCNT** | Single Walled Carbon Nanotubes |
| **MWCNT** | Multi Walled Carbon Nanotubes |
| **CVD** | Chemical Vapour Deposition |
| **EDS** | Energy Dispersive X-ray Spectroscopy |
| **Nm** | Nano meters DC Direct Current |
| **TPa** | Terapascal |
| **DSC** | Differential Scanning Calorimetry |
| **BET** | Brunauer, Emmett and Teller |
| **XRD** | X-Ray Diffraction |
| **GPA** | Giga Pascal |
| **CNT** | Carbon Nanotube |
| **VLS** | Vapour Liquid Solid |
| **PUFA** | Poly Unsaturated Fatty Acid |
| **PVC** | Poly Vinyl Chloride |
| **TBA** | Thio Barbituric acid |
| **CASP** | Center for Advanced Studies In Physics |
| **TPR** | Temperature Programmed Reduction |
| **DLS** | Dynamic Light Scattering |
| **MEMS** | Micro Electro Mechanical System |
| **CNFS** | Carbon Nanofibers |

# CHAPTER# 1

# INTRODUCTION

Any particle that has at least one of its magnitudes in nano range i.e.1 to 100 nm (Kelsall, Hamley et al. 2005). Due to exceptional properties such as excellent pharmaceutical and electronic capabilities, resistant to corrosion (Shenderova, Zhirnov et al. 2002; Wang, Serrano et al. 2002; Lu, Yang et al. 2009) and increased bio/chemical compatibility for different uses such as carcinogenic, respiration, antimicrobial, hydrogen storage, Nano composites, filtration, catalysis and biotechnology (Ajayan and Zhou 2001; Baughman, Zakhidov et al. 2002). Carbon nanoparticles because of their extraordinary uses are very much progressive particles of modern ages that have high demand in many fields largely based on the progress of excellent, simple and cheaper method for its synthesis.