INSTITUTO TECNONÓLOGICO Y DE ESTUDIOS SUPERIORES DE MONTERREY

MASTERS THESIS PROPOSAL

Fabrication of graphitic-carbon suspended nanowires through mechanoelectrospinning of photocrosslinkable polymers

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A thesis proposal submitted in fulfillment of the requirements for the degree of Master of Science in Nanotechnology (MNT)

in

ITESM Campus Estado de México
School of Engineering and Sciences

Estado de México, Atizapan de Zaragoza, May 27, 2020

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The committee members, hereby, recommend that the proposal by Antonio Osamu KATAGIRI Tanaka to be accepted to develop the thesis project as a partial requirement for the degree of Master of Science in Nanotechnology (MNT).

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Declaration of Authorship

I, Antonio Osamu KATAGIRI Tanaka, declare that this thesis titled, "Fabrication of graphitic-carbon suspended nanowires through mechanoelectrospinning of photocrosslinkable polymers" and the work presented in it are my own. I confirm that:

- This work was done wholly or mainly while in candidature for a research degree at this University.
- Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated.
- Where I have consulted the published work of others, this is always clearly attributed.
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work.
- I have acknowledged all main sources of help.
- Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself.

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INSTITUTO TECNONÓLOGICO Y DE ESTUDIOS SUPERIORES DE MONTERREY

Abstract

Faculty: Nanotechnology

School of Engineering and Sciences

Master of Science in Nanotechnology (MNT)

Fabrication of graphitic-carbon suspended nanowires through mechanoelectrospinning of photocrosslinkable polymers

by Antonio Osamu KATAGIRI Tanaka

Carbon nano-wires are versatile materials composed of carbon chains with a wide range of applications due to their high conductivity. Regardless of the high interest in the implementation of carbon nano-wires in several applications and devices, no feasible processes have been developed to fabricate carbon nano-wires with spatial control at a reasonable cost. Carbon nano-wires have been fabricated with the use of a photoresist, but little is known about polymers that can produce more conductive carbon nano-wires after pyrolysis. Various polymer solutions have been tested in near field electrospinning (NFES) and photopolymerization separately, however, few have been tested for nano-wire fabrication purposes through pyrolysis. The intention behind the thesis proposal is to implement rheology analyses of different polymer solutions to determine if they can be easily electrospun at low voltages and then fabricate nano-wires with them. This thesis work arises from the need to test a greater variety of polymers with the goal to design a polymer solution to fabricate carbon nano-wires with better conductivity than the current SU-8 polymeric nano-fibers. The research process will include the design of polymer solutions that can be electrospun, photopolymerized, and then pyrolyzed into conducting carbon nanowires. On the other hand, it is intended to engineer a newly designed polymer solution to achieve mass scale manufacturing of conductive carbon nano-wires in an inexpensive, continuous, simple and reproducible manner as central components for nano-sensors.

keywords: nanotechnology, carbon, nano-wires, electrospinning, NFES

Acknowledgements

There are a number of people without whom this thesis might not have been written, and to whom I am greatly indebted.

To my mother, Helena, who continues to learn, grow and develop and who has been a source of encouragement and inspiration to me throughout my life, a very special thank you for providing a 'writing space' and for nurturing me through the months of writing. And also for the myriad of ways in which, throughout my life, you have actively supported me in my determination to find and realise my potential, and to make this contribution to our world.

To my mother-in-law, Maryam, known only briefly but loved and missed, who represented to me 'living proof' of Black women's ability to redefine and recreate our lives despite, and maybe even because of, the tremendously constraining, oppressive and repressive situations in which we often exist.

To my dear husband, Bala who remains willing to engage with the struggle, and ensuing discomfort, of having a partner who refuses to accept the given role of the "Black woman" and is actively engaged in redefining and redesigning that role. A very special thank you for your practical and emotional support as I added the roles of wife and then mother, to the competing demands of business, work, study and personal development.

Thanks to dear Kamal and Azaria, for being so supportive - even when being 'without Mum' was hard, and for your help with the bibliography and diagrams. This work is for, and because of you and all the generations to come. It is dedicated to all our journeys in learning to thrive.

It is also dedicated to Josephine - friend, 'sister', colleague, 'co- traveller' and researcher - who knowingly and unknowingly- led me to an understanding of some of the more subtle challenges to our ability to thrive. If our attempts to claim our right to speak our truth, and to unravel and follow the threads through which our oppression is maintained, and are instrumental in helping one other Black woman from 'going over the edge' - in which sight we continuously live our lives - perhaps, it might be seen that your invaluable contribution to the attainment of many of the insights gained was worth it. It is also written in honour of all our my grandmothers, and their mothers, and grandmothers, and to all our and mothers and grandmothers, who though not marked by history struggled so heroically to resist the definitions attributed to them by the dominant system and communicate

messages of hope and expectation. I am also very grateful to Maya Angelou, for the inspiration she has been to methrough her writings, poetry readings and as a living representation of a woman thriving. Thanks to Mary Washington, Alice Walker, Jackie Kay, Buchi Emecheta, Toni Cade, Lauretta Ngobo, bell hooks, and other Black women writers of the 1980's, who in telling stories for and about us validated me and my experiences in ways I cannot begin to explain here.

Loving thanks to my friends / learning partners, Agnes, Susan, Ulana and Namonya, who played such important roles along the journey, as we mutually engaged in making sense of the various challenges we faced and in providing encouragement to each other at those times when it seemed impossible to continue. I offer my gratitude and appreciation to my supervisors, Judi Marshall and Peter Reason, for the deft ways in which you lovingly challenged and supported me through out the whole of this work - knowing when to push and when to let up. I offer special thanks to those who supported me in the mechanics of producing this thesis. Rosemary, for reading and rereading drafts; Rajwant for editing and proofing; Susan for help with typing and for helping me get 'unstuck' with this thesis on many occasions; and Peter and Trevor for 'rescuing' me at those times when I was almost defeated by the technology. Most of all thanks to God the Divine who continues to make the impossible possible.

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CEM	**C**ampus **E**stado de **M**éxico
CNWs	**C**arbon **N**ano-**w**ire**s**
DC	**D**irect **C**urrent
EMS	**E**lectro**m**echanical **S**pinning
FFES	**F**ar **F**ield de **E**lectro**s**pinning
ITESM	**I**nstituto **T**ecnonólogico y de **E**studios **S**uperiores de **M**onterrey
MA	**Ma**ssachusetts
MEMS	**M**icro**e**lectro**m**echanical **S**ystems
MNT	**M**aestría en **N**ano**t**ecnología *(Master of Science in Nanotechnology)*
MTY	**M**on**t**erre**y** *or* Campus **M**on**t**erre**y**
NFES	**N**ear **F**ield de **E**lectro**s**pinning
USA	**U**nited **S**tates of **A**merica
UV	**U**ltra**v**iolet

List of Symbols

Symbol	Name	Unit
ω	angular frequency	rad

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