

ELECTROSPINNING OF POLYAMIDE-6



Ms. Chidchanok Mit-uppatham

A Dissertation Submitted in Partial Fulfilment of the Requirements
for the Degree of Doctor of Philosophy
The Petroleum and Petrochemical College, Chulalongkorn University
in Academic Partnership with
The University of Michigan, The University of Oklahoma,
and Case Western Reserve University

2004

ISBN 974-9651-75-8

Thesis Title: Electrospinning of Polyamide-6
By: Ms. Chidchanok Mit-uppatham
Program: Polymer Science
Thesis Advisors: Asst. Prof. Pitt Supaphol
Asst. Prof. Manit Nithitanakul

Accepted by the Petroleum and Petrochemical College, Chulalongkorn University, in partial fulfilment of the requirements for the Degree of Doctor of Philosophy.

Nantaya Yanumet. College Director
(Assoc. Prof. Nantaya Yanumet)

Thesis Committee:

Nantaya Yanumet.
(Assoc. Prof. Nantaya Yanumet)

P. Supaphol
(Asst. Prof. Pitt Supaphol)

Manit Nithitanakul
(Asst. Prof. Manit Nithitanakul)

Anuvat Sirivat
(Assoc. Prof. Anuvat Sirivat)

R. Rattthapol
(Dr. Rattthapol Rangkupan)

T. Amornsakchai
(Assoc. Prof. Taweechai Amornsakchai)

บทคัดย่อ

ชิตชนก มิตรอุปถัมภ์ : การป้อนเส้นใยด้วยไฟฟ้าสถิตของพอลิเอไมด์ 6 อ. ที่ปริกษา :
ผศ.ดร. พิชญ์ สุภผล และ ผศ.ดร.มานิตย์ นิธิธนากุล 101 หน้า ISBN 974-9651-75-8

กระบวนการป้อนเส้นใยด้วยไฟฟ้าสถิตเป็นกระบวนการที่เกิดจากการให้ศักย์ไฟฟ้าแรงสูงแก่สารละลายพอลิเมอร์หรือพอลิเมอร์หลอมเหลว โดยเส้นใยจะถูกป้อนออกจากหัวฉีดและตกลงบนอุปกรณ์รองรับเส้นใย เส้นใยที่ผลิตได้นี้จะมีขนาดเล็กมาก โดยอาจมีขนาดอยู่ในระดับนาโนเมตร สำหรับในงานวิจัยนี้ ได้ศึกษาผลของปัจจัยต่างๆ ที่มีผลต่อสัมพันธวิทยาและขนาดเส้นผ่านศูนย์กลางโดยเฉลี่ยของเส้นใยพอลิเอไมด์ 6 ที่ผลิตได้ ปัจจัยที่ทำการศึกษานี้แบ่งเป็น ปัจจัยที่เกิดจากสารละลายพอลิเมอร์ และปัจจัยที่เกิดจากกระบวนการผลิต สำหรับในส่วนของปัจจัยที่เกิดจากสารละลายพอลิเมอร์นั้น ได้ศึกษาผลของความเข้มข้นของสารละลายพอลิเมอร์ น้ำหนักโมเลกุลโดยเฉลี่ย อุณหภูมิของสารละลาย ชนิดของตัวทำละลาย และการเติมเกลือลงในสารละลาย โดยได้ศึกษาสมบัติของสารละลาย ได้แก่ ความหนืด แรงตึงผิว และค่าการนำไฟฟ้าที่วัดจากสารละลายในระบบต่างๆ พบว่ามีผลอย่างมากต่อการเปลี่ยนแปลงสัมพันธวิทยาและขนาดของเส้นใย สำหรับการศึกษาในส่วนของปัจจัยที่เกิดจากกระบวนการผลิตนั้น พบว่าหากเปลี่ยนประเภทของศักย์ไฟฟ้าที่ให้แก่สารละลาย โดยอาจเป็นศักย์ไฟฟ้าชนิดบวก หรือลบ จะทำให้เกิดความแตกต่างของสัมพันธวิทยาและขนาดของเส้นใย โดยหากเป็นศักย์ไฟฟ้าชนิดลบ เส้นใยที่ผลิตได้จะมีลักษณะเป็นเส้นแบนและมีขนาดใหญ่กว่าศักย์ไฟฟ้าชนิดบวก ซึ่งมีลักษณะเป็นเส้นกลม

ABSTRACT

4392001063: POLYMER SCIENCE PROGRAM
Chidchanok Mit-upatham: Electrospinning of Polyamide-6
Thesis Advisors: Asst. Prof. Pitt Supaphol and
Asst. Prof. Manit Nithitanakul, 101 pp. ISBN 974-9651-75-8
Keywords: Electrostatic spinning/ Electrospinning/ Ultrafine fibers/
Polyamide-6/ Electrode polarity

Electrostatic spinning or electrospinning is a process by which a high electrical potential is applied to a polymer solution or melt across a finite distance between a nozzle and a collective target to produce ultrafine fibers with diameters in the sub-micrometer down to nanometer range. In this research work, the effects of various solution parameters (i.e. concentration, average molecular weight of the polymer, solution temperature, solvent systems and added salt) and process parameters (i.e. electrostatic field strength and emitting electrode polarity) on morphological appearance and average size of electrospun polyamide-6 (PA-6) fibers were investigated using optical scanning (OS) and scanning electron microscopy (SEM) techniques. For the investigation of solution parameters based on the solution properties (i.e. viscosity, surface tension and conductivity) characterizing, it was found that these properties were important factors on the morphology and the diameter of the fibers obtained. For the investigation of process parameters, the morphological appearance and the diameter between fibers obtained from positive or negative polarities were differences. The as-spun PA-6 fibers from negative polarity were flat with average size being much larger than those from positive polarity which appeared to be round.

ACKNOWLEDGEMENTS

I would like to sincerely express my highly gratefulness to my both advisors; Asst. Prof. Pitt Supaphol and Asst. Prof. Manit Nithitanakul for their guidance, useful advices, kind and constructive criticism, consistent inspiration and encouragement throughout this research.

I also would like to give my thankfulness to Assoc. Prof. Nantaya Yanumet, Assoc. Prof. Anuvat Sirivat, Assoc. Prof. Taweechai Amornsakchai, Dr. Rattapol Rangkupan, for being as my thesis committee and giving me the comments and suggestions.

The financial supports for this research from the National Research Council of Thailand (contract grant number: 03009582-0002), Chulalongkorn University (through invention and research grants from the Ratchadapesek Somphot Endowment Fund), and the Petroleum and Petrochemical Technology Consortium (through a Thai governmental loan from Asian Development Bank (ADB)) are also acknowledged. Polyamide-6 resin, raw materials used in this work, were supported by Asia Fiber Public Co., Ltd. (Thailand). These supports are gratefully acknowledged.

I would like to thank the Department of Materials Technology, Faculty of Science, Ramkhamhaeng University for the permission to let me taking leave for PhD study, and also partial funding from Ramkhamhaeng University.

I would like to express my sincerely gratitude to all faculties and staff at the PPC for knowledge that I learnt from them as well as their help to facilitate all work. I also appreciate for the support and encouragement from all of my friends at PPC. Especially, I would like to thank Ms. Porntip Pattayakorn, Ms. Raweewan Klaewkla, Ms. Jutawan Sutasinpromprae, Ms. Sujinda Jitjaicham, Dr. Laddawan Wannatong for fruitful discussion, and sincere friendship.

Finally, I would like to express my deep grateful to my parents and my husband for their love, caring and supporting me at all times.

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