

**DEVELOPMENT OF NIOSOMES ENTRAPPED WITH
EXTRACTS FROM NATIVE THAI SILK (*Bombyx mori*)
AS ANTI-WRINKLE COSMETIC PRODUCTS**

SUPANIDA WINITCHAI

**DOCTOR OF PHILOSOPHY
IN PHARMACY**

**THE GRADUATE SCHOOL
CHIANG MAI UNIVERSITY**

OCTOBER 2010

**DEVELOPMENT OF NIOSOMES ENTRAPPED WITH
EXTRACTS FROM NATIVE THAI SILK (*Bombyx mori*)
AS ANTI-WRINKLE COSMETIC PRODUCTS**

SUPANIDA WINITCHAI

**A THESIS SUBMITTED TO THE GRADUATE SCHOOL IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY
IN PHARMACY**

**THE GRADUATE SCHOOL
CHIANG MAI UNIVERSITY**

OCTOBER 2010

DEVELOPMENT OF NIOSOMES ENTRAPPED WITH EXTRACTS FROM
NATIVE THAI SILK (*Bombyx mori*) AS ANTI-WRINKLE
COSMETIC PRODUCTS

SUPANIDA WINITCHAI

THIS THESIS HAS BEEN APPROVED
TO BE A PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY
IN PHARMACY

EXAMINING COMMITTEE

THESIS ADVISORY COMMITTEE

Aranya ManosroiCHAIRPERSON..... *Aranya Manosroi* ADVISOR
Prof. Dr. Aranya Manosroi Prof. Dr. Aranya Manosroi

Jiradej ManosroiMEMBER..... *Jiradej Manosroi*CO-ADVISOR
Prof. Dr. Jiradej Manosroi Prof. Dr. Jiradej Manosroi

Surapol N.MEMBER..... *Masahiko Abe*CO-ADVISOR
Assoc. Prof. Dr. Surapol Natakankitkul Prof. Dr. Masahiko Abe

W-IssarangpornMEMBER
Lect. Witchpong Issarangporn

Aurasorn S.MEMBER
Asst. Prof. Dr. Aurasorn Saraphanchotiwitthaya

14 October 2010

© Copyright by Chiang Mai University

ACKNOWLEDGEMENTS

I am greatly grateful to the guidance, advices, patience and the technical supports in the correction of the thesis and manuscript for publication of Prof. Dr. Aranya Manosroi, my major advisor. My sincere thanks to Prof. Dr. Jiradej Manosroi, my co-advisor for his valuable advices and supports.

I greatly appreciate Prof. Dr.Masahiko Abe, my foreign co-advisor for his suggestions.

I wish to sincerely thank Lecturer Witchpong Issarangporn, Assoc.Prof. Dr.Surapol Natakankitkul and Asst.Prof.Dr.Aurasorn Saraphanchotiwitthaya for being the examining committees of my thesis defense.

I would like to thank Kasetsart Agricultural and Agro-Industrial Product Improvement Institute, Kasetsart University (KAPI); Thailand Toray Science Foundation (TTSF); Kasetsart University Research and Development Institute (KURDI) and The Thailand Research Fund (TRF), and the Nanoscience and Nanotechnology Center at Faculty of Science, Chiang Mai University.

My sincere thanks to the Faculty of Pharmacy and all of the staffs and graduate students at Natural Product Research and Development Center (NPRDC), Institute for Science and Technology Research and Development, Chiang Mai University and Kasetsart Agricultural and Agro-Industrial Product Improvement Institute, Kasetsart University (KAPI).

Finally, I would like to express my deep gratitude to my family for their continuing warm moral support throughout my study.

Supanida Winitchai

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved