

**SYNTHESIS OF CHITOSAN-FOLIC ACID FOR ENCAPSULATION OF
IRON OXIDE NANOPARTICLES AND *In Vivo* TRACKING
USING MAGNETIC RESONANCE IMAGING**

CHUTIMON SANJAI

**MASTER OF SCIENCE
IN MEDICAL RADIATION SCIENCES**

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่

Copyright© by Chiang Mai University

All rights reserved

THE GRADUATE SCHOOL

CHIANG MAI UNIVERSITY

OCTOBER 2013

**SYNTHESIS OF CHITOSAN-FOLIC ACID FOR ENCAPSULATION OF
IRON OXIDE NANOPARTICLES AND *In Vivo* TRACKING
USING MAGNETIC RESONANCE IMAGING**

CHUTIMON SANJAI

**A THESIS SUBMITTED TO THE GRADUATE SCHOOL IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
MASTER OF SCIENCE
IN MEDICAL RADIATION SCIENCES**

**THE GRADUATE SCHOOL
CHIANG MAI UNIVERSITY
OCTOBER 2013**

**SYNTHESIS OF CHITOSAN-FOLIC ACID FOR ENCAPSULATION OF
IRON OXIDE NANOPARTICLES AND *In Vivo* TRACKING
USING MAGNETIC RESONANCE IMAGING**

CHUTIMON SANJAI

**THIS THESIS HAS BEEN APPROVED
TO BE A PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF MASTER OF SCIENCE
IN MEDICAL RADIATION SCIENCES**

EXAMINING COMMITTEE

.....*Jiraporn R.*..... CHAIRPERSON

Dr. Jiraporn Rojtinnakorn

.....*Suchart Kothan*..... MEMBER

Assoc. Prof. Dr. Suchart Kothan

.....*Warayuth Sajomsang*..... MEMBER

Dr. Warayuth Sajomsang

THESIS ADVISORY COMMITTEE

.....*Suchart Kothan*..... ADVISOR

Assoc. Prof. Dr. Suchart Kothan

.....*Warayuth Sajomsang*..... CO-ADVISOR

Dr. Warayuth Sajomsang

11 October 2013

© Copyright by Chiang Mai University

ACKNOWLEDGEMENTS

I would like to thank all the people who have assisted me throughout my master studies at Chiang Mai University. The work described in this thesis would not have been possible without the help of many people. First of all, I would like to thank my advisor Assoc. Prof. Dr. Suchart Kothan, for believing in my abilities from the very beginning and who constantly supported me in writing my thesis. He has always encouraged me and displayed a positive attitude, and expertise throughout the process. I am very thankful to Dr. Warayuth Sajomsang who bravely agreed to be my co-advisor and who also provided valuable guidance and support. I would also like to give special thanks to Ms. Pattarapond Gonil for her helpful guidance and encouragement, for providing me access to experimental facilities. I am grateful to The National Research University Project under Thailand's Office of the Commission of Higher Education (CHE), Thailand for their financial support and scholarship funding my work. I am indebted to The National Nanotechnology Center (NANOTEC) and The National Science and Technology Development Agency (NSTDA), Thailand for providing experimental facilities and material support.

I would like to thank my committee members; Dr. Jiraporn Rojtinakorn for taking time to critically review my work and who provided, constructive comments and invaluable suggestions. I am especially grateful to Dr. Warayuth Sajomsang for timely suggestions and explanations during the editing of this thesis.

Additional thanks and recognition should be given to my colleagues at The Center of Excellence for Molecular Imaging (CEMI)'s members, as well as The National Nanotechnology Center (NANOTEC)'s members for their warm and friendly, assistance who provided me with laboratory access.

Finally, I would like to thank my parents, the most important people in my life, for their endless support, continued patience, and encouragement. They helped me through difficult times and made the good times even better.

Chutimon Sanjai