

**THEORETICAL STUDIES ON PHOTOPHYSICAL AND PHOTOCHEMICAL
PROPERTIES OF 2-(2'-HYDROXYPHENYL)BENZIMIDAZOLE
AND ITS DERIVATIVES AS FLUORESCENT DYE**

NATTHAPORN MANOJAI

**DOCTOR OF PHILOSOPHY
IN CHEMISTRY**

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

**GRADUATE SCHOOL
CHIANG MAI UNIVERSITY
APRIL 2017**

**THEORETICAL STUDIES ON PHOTOPHYSICAL AND PHOTOCHEMICAL
PROPERTIES OF 2-(2'-HYDROXYPHENYL)BENZIMIDAZOLE
AND ITS DERIVATIVES AS FLUORESCENT DYE**

NATTHAPORN MANOJAI

**A THESIS SUBMITTED TO CHIANG MAI UNIVERSITY IN PARTIAL
FULFILLMENTS OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY**

IN CHEMISTRY

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

GRADUATE SCHOOL, CHIANG MAI UNIVERSITY

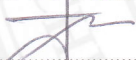
APRIL 2017


THEORETICAL STUDIES ON PHOTOPHYSICAL AND PHOTOCHEMICAL
PROPERTIES OF 2-(2'-HYDROXYPHENYL)BENZIMIDAZOLE
AND ITS DERIVATIVES AS FLUORESCENT DYE


NATTHAPORN MANOJAI

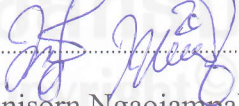
THIS THESIS HAS BEEN APPROVED TO BE A PARTIAL FULFULLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY
IN CHEMISTRY


Examination Committee:


..... Chairman
(Dr. Supawadee Namuangruk)



..... Member
(Assoc. Prof. Dr. Jaroon Jakmunee)



..... Member
(Asst. Prof. Dr. Nawee Kungwan)



..... Member
(Dr. Chanisorn Ngaojampa)


..... Member
(Asst. Prof. Dr. Burapat Inceesungvorn)

Advisory Committee:


..... Advisor
(Asst. Prof. Dr. Nawee Kungwan)


..... Co-advisor
(Dr. Chanisorn Ngaojampa)


..... Co-advisor
(Asst. Prof. Dr. Burapat Inceesungvorn)

10 April 2017

Copyright © by Chiang Mai University

ACKNOWLEDGEMENT

From a general student, all the opportunities that I received, have guided me towards my success. I would like to thank all the people who help me to become what I am today from the core of my heart. It is an honor for me to give my acknowledgements here to all the people who provided their unselfish assistance.

First and foremost, I owe my deepest gratitude to my advisor Asst. Prof. Dr. Nawee Kungwan, whose guidance and kind encouragements enabled me to complete this research. I have benefited a great deal from not only his valuable scientific insights but also his positive views on life. With his support, I am much more confident of my academic research and also my future life.

I would like to give my heartily thanks to my co-advisors Dr. Chanisorn Ngaojampa and Asst. Prof. Dr. Burapat Inceesungvorn for their kind consideration and discussion of our academic environment and requirements. My special thanks go to Dr. Supawadee Namuangruk and Assoc. Prof. Dr. Jaroon Jakmunee for being my examination committee. I sincerely thank Graduate School and Department of Chemistry, Chiang Mai University.

This thesis would not have been possible without the shared discussion and collaboration with my dear classmates particularly Dr. Rathawat Dangngern from Department of Chemistry, Faculty of Science, King Mongkut's Institute of Technology Ladkrabang, Ms. Khanittha Kerdpol, and group members of Computational Chemistry Laboratory (CCL) at Chiang Mai University. Without these people, my research could not be completed.

Finally, I would like to thank my great valuable people, my dearest family who is always kind to give me guidance and take me to my dream. I offer my thanks and blessings to beloved my father, my mother and my older sister, for their endless love and support.

Natthaporn Manojai