

**DEVELOPMENT OF ELECTROCHEMICAL SENSOR
BASED ON SIMPLE SCREEN PRINTED ELECTRODES
FOR QUANTITATIVE DETERMINATION OF
HYDROQUINONE BY FLOW INJECTION
AMPEROMETRIC SYSTEM**



**MASTER OF SCIENCE
IN CHEMISTRY**

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

**GRADUATE SCHOOL
CHIANG MAI UNIVERSITY
JULY 2015**

**DEVELOPMENT OF ELECTROCHEMICAL SENSOR BASED ON
SIMPLE SCREEN PRINTED ELECTRODES FOR QUANTITATIVE
DETERMINATION OF HYDROQUINONE BY FLOW
INJECTION AMPEROMETRIC SYSTEM**

JANTIMA UPAN

**A THESIS SUBMITTED TO CHIANG MAI UNIVERSITY IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE
IN CHEMISTRY**

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

**GRADUATE SCHOOL, CHIANG MAI UNIVERSITY
JULY 2015**

**DEVELOPMENT OF ELECTROCHEMICAL SENSOR BASED ON
SIMPLE SCREEN PRINTED ELECTRODES FOR QUANTITATIVE
DETERMINATION OF HYDROQUINONE BY FLOW
INJECTION AMPEROMETRIC SYSTEM**

JANTIMA UPAN

THIS THESIS HAS BEEN APPROVED TO BE A PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE
IN CHEMISTRY

Examination Committee:

Advisor:

N. Youngvises
..... Chairperson
(Assoc. Prof. Dr. Napaporn Youngvises)

Jaroon Jakmune
.....
(Assoc. Prof. Dr. Jaroon Jakmune)

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

Surin Saipanya
..... Member
(Asst. Prof. Dr. Surin Saipanya)

29 July 2015

Copyright © by Chiang Mai University

ACKNOWLEDGEMENTS

The author would like to express her sincere gratitude and is greatly indebted to her thesis advisor, Assoc. Prof. Dr. Jaroon Jakmune, for his kind supervision, invaluable guidance, comments, suggestions and consistent motivation, constant encouragement and financial support throughout this research.

The author is truly grateful to Assoc. Prof. Dr. Napaporn Youngvises for her valuable comments, suggestion and discussion, and she also thanks to Asst. Prof. Dr. Surin Saipanya for her valuable advice, assistance and providing nanomaterials.

The author gratefully acknowledges Human Resource Development in Science Project (Science Achievement Scholarship of Thailand, SAST) for granting and sponsoring a full scholarship for her graduate study. The author thanks Department of Chemistry, Faculty of Science, Chiang Mai University, the Graduate School and Nanomaterial Research Unit, Chiang Mai University for all supports.

Her acknowledgements are extended to all her friends at the Research Laboratory on Development of Analytical Instrument and Electrochemistry (AIE) group for their kind suggestions, assistances and encouragements.

The author expresses her greatest gratitude to her parents, sister, brother and everyone whom may concern to her success for their endless love and continual encouragement throughout the study. Finally, the author would like to thank those

whose names are not listed here, who have contributed to the success of this study.

Jantima Upan



ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved