

**DETERMINATION OF CADMIUM LEAD AND  
ZINC AT TRACE CONCENTRATION LEVEL  
BY ANODIC STRIPPING VOLTAMMETRY  
WITH BISMUTH-MODIFIED SCREEN-  
PRINTED ELECTRODE**



**THARINEE SRIDARA**

**MASTER OF SCIENCE  
IN CHEMISTRY**

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่  
Copyright© by Chiang Mai University  
All rights reserved

**GRADUATE SCHOOL  
CHIANG MAI UNIVERSITY  
DECEMBER 2016**

**DETERMINATION OF CADMIUM LEAD AND ZINC AT TRACE  
CONCENTRATION LEVEL BY ANODIC STRIPPING  
VOLTAMMETRY WITH BISMUTH-MODIFIED  
SCREEN-PRINTED ELECTRODE**

**THARINEE SRIDARA**

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

**GRADUATE SCHOOL, CHIANG MAI UNIVERSITY  
DECEMBER 2016**

DETERMINATION OF CADMIUM LEAD AND ZINC AT TRACE  
CONCENTRATION LEVEL BY ANODIC STRIPPING  
VOLTAMMETRY WITH BISMUTH-MODIFIED  
SCREEN-PRINTED ELECTRODE

THARINEE SRIDARA

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:

*Jaroon Junsomboon*  
..... Chairman  
(Dr. Jaroon Junsomboon)

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

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

*Chanida Puangpila*  
..... Member  
(Dr. Chanida Puangpila)

6 December 2015

Copyright © by Chiang Mai University

## ACKNOWLEDGEMENTS

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

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 Chiang Mai University for all support.

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 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.

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่  
Copyright© by Chiang Mai University  
All rights reserved

Tharinee Sridara