ACKNOWLEDGEMENT

This thesis was successfully completed with invaluable support and assistance from many individuals, both academically and in the research process, as well as emotionally. I would like to express my deepest gratitude to the following people:

Assoc. Prof. Dr. Lek Wantha, my thesis advisor from the School of Chemical Engineering at Suranaree University of Technology, provided me with educational opportunities, offered invaluable guidance in my research, and assisted in every aspect of my academic and personal life. He consistently supported various research endeavors, meticulously reviewed, and corrected this thesis, ensuring its successful completion.

I would like to thank my thesis committee members, Asst. Prof. Dr. Atthaphon Maneedaeng, Prof. Dr. Adrian Evan Flood and Prof. Dr. Hongxun Hao for agreement to the part of my committee for my thesis defense. Thank you for your valuable comments and recommendations.

I extend my sincere thanks to all faculty members of the School of Chemical Engineering at Suranaree University of Technology for their dedicated teaching, guidance, and support throughout my academic journey.

Special thanks to Mr. Saran Dokmaikun, a staff member at the Center for Scientific and Technological Equipment, for facilitating the finding of instruments and providing essential guidance during the research process.

Thank you to Mrs. Amphorn Ladnongkhun for her assistance, coordination, and advice on documentation throughout my studies.

I sincere thanks to Prof. Hongxun Hao and members of research group (National Engineering Research Center of Industrial Crystallization Technology, NERCICT) at Tianjin University, China for exchange program of practical research process.

The author would like to thank you to the National Science and Technology Development Agency (NSTDA) according to the Thailand Graduate Institute of Science and Technology (TGIST) scholarship agreement No. SCA-CO-2563-12080-EN for financial

support and Suranaree University of Technology research fund. The authors also acknowledge the research funding from (i) Suranaree University of Technology (SUT), (ii) Thailand Science Research and Innovation (TSRI), and (iii) National Science, Research and Innovation fund (NSRF)-Grant No. 195675.

Finally, I would like to extend my heartfelt thanks to my parents for their unwavering support, encouragement, and financial assistance throughout my studies. Additionally, I am grateful to my fellow graduate students and members of chemical engineering in National University of Laos for their continuous support, motivation, and advice, which has been vital to the completion of this thesis. I am profoundly appreciative and would like to express my highest gratitude to everyone mentioned here.

Chonut Xaiyathoumma