

ACKNOWLEDGEMENTS

I am deeply grateful to Prof. Dr. Jatuporn Wittayakun for his invaluable guidance, constructive feedback, unwavering support, and for continually inspiring me with fascinating research projects. This work would not have been possible without his encouragement, insight, and collaboration.

I sincerely appreciate my mentor, Dr. Chalermpan Keawkumay, for his dedication in the laboratory, thoughtful feedback, continuous encouragement, and invaluable guidance throughout my research journey.

I would also like to extend my gratitude to all JW group members for their constant support and encouragement. I feel truly fortunate to be part of such an inspiring and collaborative team.

Special thanks to Saran Youngjan, Pawan Boonyoung, and Dr. Pongtanawat Khemthong from the National Nanotechnology Center (NANOTEC), National Science and Technology Development Agency (NSTDA), Thailand, for their generous assistance with CO₂ adsorption studies.

Most importantly, I am profoundly grateful to my family for their unconditional love and unwavering support in every aspect of my life. Their belief in me has been my greatest motivation.

Chalida Upan