

## **DEDICATION**

To my grandmother, Gum Fung Yee, who passed away in 1994 at age 82. She took care of me when I was young, and I didn't appreciate what she gave me and how much she loved me until after she passed away. Thank you for raising me as a child and making sure I wasn't a troublemaker (too little, too late).

## **PERSONAL BIOGRAPHY**

Paul Chin was born on November 30<sup>th</sup>, 1979 (Roman calendar) in Hong Kong en route to the United States. One month later he transitioned to the United States of America with his mother. He spent the first nine years of his life in Flushing, NY, and the latter nine years of his childhood in Burlington, MA. He is a Red Sox and a NY Mets/Yankees fan, making him the ultimate baseball paradox. Paul was a part-time Chinese restaurant front desk worker, part-time hospital volunteer, part-time actor in crazy high school videos, but a full-time wise-cracking New Englander.

After graduating with his high school diploma in 1997 from Burlington High School, he attended Cornell University for his undergraduate degree in Ithaca, NY. He volunteered substantially in his fraternity, Alpha Phi Omega, was active in the AIChE student chapter, and co-oped at Air Products and Chemical, Inc. He graduated with his Bachelors of Science in Chemical Engineering in May 2001, where he will be forever indebted to (both intellectually and financially).

In August 2001, he joined the rank of graduate student at North Carolina State University in Raleigh, NC, for his graduate degree in chemical engineering. His research focused on structured catalytic supports for fuel cell applications using kinetics, catalysis, and reaction engineering. He was co-advised by Drs. George W. Roberts and James J. Spivey.

## ACKNOWLEDGEMENTS

First and foremost, I would like to thank my advisors Drs. George W. Roberts and James J. Spivey for their endless dedication, direction, and discussion. Without them I would not have achieved my goals for this thesis. Both of them have always been there, especially late in the evenings, when I needed help the most. I would also like to thank the Department of Energy for the research funds, and the chemical engineering department at North Carolina State University for taking a chance on me.

Secondly, I would like to thank Dr. Xiaolei Sun who worked with me as a post-doctorate when I started. Without her, I would have struggled to get my research off the ground. Thank you to Christopher J. Kloxin who composed the initial Matlab program for the pulse chemisorption and TPD analysis. Thank you to Kyle M. Bishop, a summer REU student who helped me model the r-WGS reaction equilibrium.

Thirdly, I would like to thank fellow graduate students Esther M. Wilcox and Susan M. Sigmon. Esther, thank you for putting up with me and teaching me the difference between a male and female fitting. Susan, thank you for teaching me about mammal anatomy using a Dr. Seuss book (Horton Hatches The Egg). I would also like to thank Apostolos (Tolis) A. Nikolopoulos for sharing all of his technical knowledge and expertise with me.

Fourthly, I would like to thank the wonderful employees at the NC State Machine Shop. Even though I could see their inner groans and sad faces every time I walked into the shop with my reactor, they were always helpful, fixed my problems, and welded on flanges to prevent more trips to the physical therapist from trying to open my old reactor.

Fifthly, I would like to thank Joan D. Patterson, Angelica M. Sanchez, and Brian G. Prevo, for making my three years here wonderful. We had a small incoming class, and without their support and understanding in my life I would not have made it past the first year. Also I would like to thank my exceptionally close high school friends, Emily K. Cheung, Chad A. Parmet, Calvin Ho, and Kenneth Eaton, all who have helped me in one form or another through tough times in various stages of my life.

Sixthly, I would like to thank Christopher A. Post, whom without his full love and support these past two and a half years, I would not have realized my full potential. Thank you so much.

Last, but not least, I would like to thank my family members, especially my parents, my brother Benjamin, and my sister-in-law Urvi. Without them I would have never made it this far in life. They have been there for me every step of the way, have always loved me unconditionally, and have supported me through all of my tough decisions. Were it not for them, I would not be the thoroughly neurotic, obsessive-compulsive (just kidding!) person I am today.