Completion of doctoral research to write up this thesis, not only represents my work at the keyboard. There are many amazing people who owe the reason of being part of this thesis and without whom this work would not have touched its summit. First and foremost, I would like to express my sincere thankfulness to my research guide Prof. (Dr.) Anjali Patel, for making me familiar to this impressive and astonishing field of catalysis. I am grateful to her for providing me with all the necessary facilities to carry out this research, even going out of her way. Her invaluable help and advice during my entire doctoral research have driven successful learning. Her constant enforcement helped me to remain engrossed on achieving my goal. Regardless of her sincere dedication to numerous other responsibilities as the Head of the Department, she has always been attentive to my queries and made it a point to solve them to the best of her abilities. Her keenness, fundamental understanding on research and her quest for providing benchmark work, has made an influencing impression on me. Without her tutelage, constant support and continuous feedback this research and doctoral thesis would not have been feasible. Her methodical and editorial advice along with the visions on the accomplishments of academic research was indispensable for completion of this thesis work. Apart from this, it is inevitable to express my eternal gratitude for her mentorship which has guaranteed my allround development as a person, and to become a better human being. Her resolute valour and principles will always inspire me.

I would like to thank BRNS (37(2)/14/34/2014-BRNS, Mumbai) for financial support in terms of Junior Research Fellowship (JRF) and Senior Research Fellowship (SRF).

My sincere thanks to **Prof. (Dr.) Anjali Patel**, Head, and Prof. N. D. Kulkarni, Former Head, Department of Chemistry, The Maharaja Sayajirao University of Baroda, Vadodara for providing infrastructure facility.

I am grateful to the following persons and institutions for their assistance during the different stages of my research work.

Solution NMR and BET FIST – I, DST

TG-DTA and Department of Chemistry, The

GC-MS Maharaja Sayajirao University of

Baroda

FT - Raman Faculty of Science, The Maharaja

Sayajirao University of Baroda

EDX Analysis Prof. Vandana Rao, Metallurgy

Department, The Maharaja Sayajirao

University of Baroda

Powder XRD CSMCRI, Bhavnagar

Solid state MAS NMR SAIF, IIT - Bombay and IISc,

Bengaluru

XPS IIT-Kanpur

TEM, HRTEM and SAIF, IIT - Bombay

**STEM** 

First of all, I would like to thank my beloved God, who has been my sole inspiration, and who's many blessings and guidance has made me who I am today. The thesis would not have come to a successful completion, without the assistance of certain people with whom I am indebted for their contribution in various stages of my work. I am grateful to my senior, Dr. Soyebkhan Pathan for his counsels at the early stage of my research and being there whenever I needed his help and assistance. My colleagues and best friends, Dr. Priyanka Solanki and Mr. Rajesh Sadasivan, have been my enduring supports in the lab and always by my side at all times. I thank them with all my heart. My earnest thanks to my juniors Mr. Jay Patel, Ms. Dhruvi Pithadia and Ms. Shivani Sharma for providing a jovial environment.

I am also thankful to all non-teaching staff especially Mr. Raval, Mr. Rane and Mrs. Revathi, Chemistry Department for their assistance throughout my research work.

I am thankful to friends and colleagues of the department, Dr. Rina Soni, Dr. Kanu Katariya, Dr. Viraj Bhanvadia, Mr. Pratik Nariya, Mr. Rajdeep Pateliya, Mr. Irfan Shaikh, Mr. Hiten Raval and Mr. Chirag Savani for their friendly behavior, help and support. A special thank you to all the teaching staff for their help and guidance during the course of my research work.

The most important support system of my life has been my family. No amount of words would suffice to thank my parents for letting me follow my dream and inspiring me spiritually, yet always being there and having my back through out. Thank you to my brother, Ayaz for continuously encouraging me and pushing me to go on. I am glad to express my gratitude to my Bhabhi, Naziya for her constant support and words of wisdom during my research tenure. Loads of love to my nephew, Mohammad Rehan and my niece, Aqsa for giving me happy days and helping me to overcome the worries of my struggles. Special thanks to my friends, whose words of encouragement have kept me going through the ups and downs of my odyssey.