Acknowledgements

To be a scientist was my childhood dream, and an endeavor such as this cannot be accomplished without the help of a handful of people in one's life from time to time. And now it is my turn to thank all my near and dears from the depth of my heart.

I am extremely thankful to **Prof. D.K. Kanchan**, my supervisor, for inspiring me to join this really important field of research, called, *Solid State Ionics*. His inspiring guidance, constant encouragement and support throughout the course of this research work has helped me a lot to carry out my research work with and achieve necessary skills to be a successful researcher in my field. It is really an honor to have worked under his guidance.

I am thankful to **Prof. C.F. Desai** for providing various research instruments in the MRL and Crystal Growth Laboratories of the department, which were instrumental for efficiently carrying out all the characterization works under a single roof. I am thankful to other members of the department also for helping me as and when needed.

My special thanks are to My Colleague, **Ms. Poonam Sharma**, who helped me a lot while in the time of this course. I am Thankful to other lab-mates Meenakshi, Neerali, Dharmesh and Gargi and Apeksha for making the lab time a healthy time. I am also thankful to my friends in the department: Dharmendra, Naveen, Nishant, Asit, Chaitali, Dolly, Sejal, Ketan, Abhishek to name a few.

I am indebted to my friend Sunil Shah for carrying out X-ray analysis of all samples, without his timely help my work could not have progressed even a bit. Benson, from IIT-Madras has been a good friend and has really helped by providing some of the important research articles in time of need. I am grateful to my friend Nirmalya Chaterjee for timely sending some of the rare research papers promptly at my request. I am thankful to my friend, Mahipal form Pt. Ravishankar University, Raipur for helping out to understand and carry out battery application work successfully. Time spent at NIT Surat was really memorable one. I feel really privileged to have worked with Dr. Ajay Rai, Dr. Vipul, Dr. Lalit Saini, Dr. Kamlesh Pathak, and good friends Kunwar, Sid, Sanjay, Akshay, Debesh and Kinjal.

I am thankful to Dr. Rahul Ghildiyal and Dr. Ran Bahadur for being friends for these many years and helping me during these days. I am grateful to all my teachers at Faculty of Technology & Engineering, especially Prof. Potbhare, Prof. Arun Pratap, Dr. Chakraborty, Dr. Jignesh Pandya and Dr. Kirit Lad for encouraging me to have a career in research. I am thankful to all of My Undergraduate college teachers especially, Mr. P.G. Acharya, Mr. N.A. Thakar, Mr. V. A. Bheda, Mr. M.V. Acharya Mr. R.N. Dave, Mr. D.B. Desai, Mr. N.N. Roghelia and Mr. Nilay Mehta, who made physics and mathematics easily graspable for an average student like me and persuaded to have a degree in higher education in sciences.

I am also indebted to my college time friends Mohit, Nigam, Kapil, Parthiv, Ramesh, Shyam, Nimish, Praveen and Pritesh Shah. They really made life enjoyable during those days. It was their encouragement in the laboratory classes that I developed a keen interest towards experimental work and applied research.

I am extremely grateful to my school teacher Mr. Anil P. Lad for introducing me to the world of physics at a very young age. He encouraged me to think like a physicist; without his encouragement I would have never thought of taking a career in basic sciences. I will always remain indebted to him. I am thankful to Geeta teacher who taught us to believe in our dreams and work towards fulfilling them.

Finally, the course of this study has made my family members suffer a lot. And, merely words cannot express my gratitude towards them. However, still, I would take this opportunity to thank them for being patient for these many years. I would like to take this opportunity to remember my Grandfather (Late) Shree Dineshchandra, who will always be a figure of inspiration for me. Finally, I would like to thank my first teachers, **Mummy** and **Papa**, for taking all pains since my early childhood, and allowing me to pursue my dreams.

At last, but the most important, my beloved wife Jyotima aka Juhi joined me in the last and most difficult phase of finishing of this thesis. I really honor and admire her patience and care for all this time.

Manish