ACKNOWLEDGEMENTS

I am thankful to the **Almighty God**, who showed me the path to through. It is very difficult to name all the sources of inspiration; moreover, words are often too weak a mode of revealing one's sentiments and feelings of indebtedness. First of all, I would like to express my sincere gratitude to my supervisor **Prof. Prabhakar Singh**. He has challenged my way of thinking and provided valuable advice, guidance and support for my research. I have learnt many things about research and various skills from him. He always insisted me in due course of time. I express my gratitude to Prof. B.N. Dwivedi, Prof. O.N. Singh and current Head of the Department Prof. Debaprasad Giri for providing me required facilities of the department. I also wish to thank my RPC members Prof. Sandip Chatterjee, Dr. Anita Mohan, and Dr. A. K, Singh for the invaluable inspiration and numerous insightful suggestions during the entire course of this research. I am also grateful to faculty members Prof. B.N. Dwivedi, Prof. O.N. Singh, Prof. D. Giri, Prof. S. Chatterjee, Prof. R, Prasad, Dr. A. Mohan, Dr. P.C. Pandey, Dr. S. Upadhyay, Dr. A.K, Srivastava, Dr. Avanish Singh Parmar, Dr. S. K, Mishra, Or. S. Tripathi , Dr. S. Patil , Dr. S. Mishra, Dr. P. Dutta , for their valuable suggestions and help time to time in my research period. I am also appreciative to Dr. A.K, Tripathi, Dr. U.N. Singh, Dr. S.K, Singh and Dr. Dr. Neha Agnihotri for their kind encouragements and motivation. I am also thankful to all the technical, non-teaching as well as official staffs of the Department of Physics for their assistance when needed and also for providing me humorous relief at times.

Moreover, I am thankful to my senior lab members Dr. Nitish Kumar Singh, Dr. Rajesh Kumar Singh, Dr. Avadesh Kumar Yadav, Dr. Raghvendra Pandey, Dr. Bheesma Pratap Singh, Dr. Satish Kumar Mandal, Dr. Priyanka A. Jha, Dr. Ashutosh Sahi, Dr Pawan Dubey and colleagues Mr. Onkar Nath Verma, Saurabh Singh, Vani Pawar, Ashish Kumar Yadav and all research colleagues of Department of Physics, IIT(BHU), for sharing their knowledge and creating enjoyable lab atmosphere both on and off the slopes. Special thanks are due to all the my departmental research colleagues Dr. Abhishek Kumar, Mr. Dilip Gupta, Mr. B.K, Singh, Mr. K,K Shukla, Mr. Abhishek Singh, Moh. Javed, Mr. Pradeep Kumar, Mr. G. Gautam, Mr. Subhashish Tiwari, Mr. Rahul Singh, Mr. Prince Gupta, Mr. Mr. V.N. Mishra, Mr. Achutesh Dixit and Mr. Pawan Kumar, Upendra Kumar, Arkadeb Pal, Ajeet Kumar Vishwkarma, Chinmoy Rajak, Dharmendra Yadav, Dibyajyoti Mohanta, Pavan Kumar, Vishwakarma, Ms. Prajyoti Singh, Ms. Ruchi Bala, Ms. Ritika Solanki, Vijay Pratap Yadav, Vinod Kumar Gangwar, and Mohd Sadiq for the help and their awesome company.

I am grateful as well for all the support and encouragement from my batch mates and all of my friends in IIT (BHU) and outside campus. I heartily express my sincere thanks for untiring help to all my friends. There are too many to name everyone here, but particular thanks also to Mr. Sanjeev Kumar, Gajendra Yadav, Mr. Pramod Kumar Rajput, Mr. Brijesh Kumar Yadav, Dr. Pramod Kumar, Ranvijay yadava, Mr. Vishnu Singh Rathore, Mr. Satendra Kumar, Mr.

Nishant Kumar Singh, Mr. Chandra Shekhar Singh, Mr. Jitendra Yadav, Mr. Sheelendra Kumar Yadav, for the essential support and the nice friendship.

I would like to express my deepest gratitude to my parents for their continuous prayer, support, and encouragement during my Ph.D. I wish to record my heartfelt regards to my father and mother, whose care has raised me to attain this esteemed pleasure of submitting this work for the degree of Ph.D. I am deeply beholden to my both sisters Akhilesh Yadav (brother-in-law Yatendra Yadav) and Dr. Yatnesh yadav (brother-in-law Dr. Avdesh Kumar Yadav), yonger brother Naveen Kumar Yadav, and other family well-wishers whose love, support and encouragement are the basis of my every success.

Furthermore, I heartily thank to Dr. Surekha Tomar and Dr. Yogesh Kumar for their lovable support for my future carrier.

I am very thankful to Prof. A.S.K, Sinha, technical staff Mr. Arjun Prasad Department of Chemical Engg. IIT (BHU) and Dr Govind Gupta, NPL New Delhi for availing me XPS measurement facilities for a few samples. I would like to acknowledge Prof. O.P. Pandey, Thapar University for providing TEC facilities, respectively. I would like specially thanks to Prof. Massimo Viviani, Institute for Energetics and Interphases (CNR-IENI), Via De Marini 6, 16149 Genova, Italy to provide the facility of electrical conductivity in reducing atmosphere.

I would also like to acknowledge the funding agencies UGC, MHRD, DST and NRB of Government of India, for financial assistance in various forms.

Last but not least, I wish to thank all my friends and foes and the persons whose names have not been included on this piece of paper for extending their cooperation directly or indirectly. This at all, if is there, this is inadvertent!

(Pravin Kumar)