Acknowledgements

This thesis is the end of my successful journey in obtaining my Ph.D. degree. This journey would have been impossible without the guidance and help of many individuals who in one way or the other contributed and extended their valuable assistance in the compilation and completion of this study. In this context, I take this opportunity to pay special tribute of admiration and honour to all who assisted, guided and supported me during my doctorate studies.

First and foremost, I am truly indebted and thankful to my supervisors, Dr. G.S.S. Saini and Dr. B.C. Choudhary for their superb guidance, constant encouragement and immense help all the times. Under their valuable guidance, I overcame all the problems and learnt a lot. I express my deep and sincere sense of gratitude to them for their continuous advice and encouragement rendered during difficult times.

My special thanks to Dr. S.K. Tripathi for his enormous encouragement, inspiring words and for all those innumerable skills which I learnt in his lab. I am extremely grateful to Professor Manmohan Gupta, Ex-Chairman and Professor C.S. Aulakh, Chairman, Department of Physics, Panjab University, Chandigarh, for providing me all the necessary facilities in completing this research work. I extend my special thanks to Dr. Davinder Mehta for offering his valuable experience, advice and assistance in my study work and for providing me the opportunity to work in his lab. I take this opportunity to acknowledge the contribution of Dr. Vasant Sathe, UGC-DAE CSR, Indore, for providing me Raman facility for my study work.

The journey to my Ph.D. started with my employment in Department of Applied Sciences, Chandigarh College of Engineering & Technology (Diploma Wing), Sector-26, Chandigarh, in the year 1998. During these long years, a number of friends, well wishers and fellow teachers extended their moral support, to only some of whom it is possible to give particular mention here. In this privilege list, I would like to express deep sense of gratitude to Er. R.S. Malik, Principal-Cum-Head of Department, Mechanical Engineering, Chandigarh College of Engineering & Technology (Diploma Wing), Sector-26, Chandigarh for his unforgettable cooperation and encouraging me to pursue research. Equally, I am obliged to Mrs. Sanjana Arora, Head of Department, Applied Sciences, Mr. S.P. Arora, HCS, and my friends, Jagdish Chander, IFS, Kuldeep Singh, M D, AS Automotives, Dr. Ranjan Kumar, Er. Parmod Goyal, Dr. G.H. Hugar, Er. M.L. Rana, Er. C.S. Sindhu, Er. S.S. Rao, Dr. Narinder Kaur, Ms. Navneet Kaur and all my colleagues, students and staff of Chandigarh College of Engineering & Technology, and Technical Education, Chandigarh Administration for their cooperation, motivation and encouragement.
My warm thanks are also due to my fellow researchers and friends: Gurpreet Singh, Ika Sachdeva, Prabhjot Kaur, Kulwinder Kaur, Randhir Singh, Akshay, Dr. Sunil, Dr. Khwinder Singh, Dr. Amit Sharma, Kriti Sharma, Alaa Shawi, Dr. Jasim M. Abbas, Rinder Kumar, Gurjeet Singh and Dr. Sanjeev, for their constant support, discussion, encouragement, and pleasant company. Mr. Gurpreet Singh deserves special thanks for his company, suggestions, never ending discussions and motivation. Special thanks Mr. Subhash Saini (Metal Workshop), Mr. Rikhi Chand and Mr. Jagtar Singh, of IF for their immense technical and mechanical assistance. Special thanks are also due to teaching and non teaching staff members, Department of Physics and SAIF, Panjab University, Chandigarh, for their lending hand in all possible ways.

I would like to thank my father-in-law, Dr. Birbal Jangpoo for his motivation, constant support and caring nature. He is always there during needy times. I will be failing my duty without thanking and appreciating my wife, Bharti Jangpo for her personal support, great patience, constant encouragement, love and care and unceasing prayers, which has enabled me to reach at this position in my life. During difficult times, she is a strong pillar standing besides me. It would have been virtually impossible for me to complete my Ph.D. degree without her. My sweet daughter, Sukriti equally deserves my deepest gratitude for the love and prayers she made along with her friends and teachers during my hospitalization.

The space will be short if I mention the names of all my well wishers, those who have, directly/indirectly supported me and their best wishes sailed me through a fatal attack of polonatremia during my Ph. D. work. I owe my sincerest thanks to all of them. I want to express my deepest gratitude to my mother, mother-in-law, brother-in-law Sachin, nephew and to all other family members for their love, care and encouragement.

The financial support from the Department of Science and Technology, Govt. of India, Delhi is greatly acknowledged. Without their financial help, it would not have been possible for me to pursue my research work.

Finally and most significantly, I would like to thank Almighty God for showering His constant blessings on me and for giving me new life.