## Acknowledgements

While submitting the Thesis, I would like to express my deep sense of gratitude towards my supervisor **Arun Prasad** for suggesting this interesting problem. This work would not have taken the present shape without his constant support and encouragement. I thank him profusely from the bottom of my heart for his guidance and motivation throughout this work. I extend my sincere thanks to the faculty members of the Civil Engineering Department: Dr. P. Bala Ramudu, Dr. Suresh Kr., Prof. Rajesh Kumar, Dr. P. R. Maiti who taught me the different subjects of Civil Engineering during the course work. I wish to express my deep regards to all faculty members and research associates of the Civil Engineering Department for their unconditional supports at every moment during the progress of my research.

I would like to thank Prof. P.K. Singh, Head, Department of Civil Engineering, Indian Institute of Technology (BHU), Varanasi for providing all facilities related to my research work.

I wish to extend my sincere gratitude towards to research progress evaluation committee members Prof. Satya Vir Singh, Department of Chemical Engineering, Dr. P. Bala Ramudu and Prof. S. B. Dwivedi, Department of Civil Engineering, Indian Institute of Technology (BHU), Varanasi for their help, criticism and encouragement during entire research work.

The author would also like to acknowledge the consistent support and friendly assistance by Prof. S. B. Dwivedi, Convener Departmental Post Graduate committee, Civil Engineering Department on many administrative matters that needed attention during preparation and submission of the thesis.

I wish to take this opportunity to thank our departmental laboratory staff Mr. Basant Prasad, Mr. Netra Pal, Mr. Deepak Kumar, Mr. Sudhanshu Pal and Mr. Umashankar for giving me the freedom to use the available resources for my research. I am obliged to the authorities of HINDALCO, Renukoot for providing me the valuable materials for my work. I also express my heartfelt gratitude and thanks to Dr. Rajeev Prakash, Chairman, central instrumentation facility center (CIFC), Indian Institute of Technology (BHU), Varanasi for permission to carry out the microstructural test. The author also remembers the help and cooperation of Mr. Sisir towards XRD, SEM and EDS studies.

The author humbly acknowledges Prof D. Venu Gopal, DST Centre for

Interdisciplinary Mathematical Sciences (CIMS), Faculty of Science, BHU for organizing training programme on LATEX for manuscript and thesis writing.

I sincerely acknowledge the affectionate forbearance and continuous encouragement received from my friends Mr. Shiwanshu Shekhar, Mr. Chayan Gupta, Mr. Niteesh Singh Bonal, Mr. Shashi Kumar, Mr Alok Ranjan, Mrs. Sonali Saxena, Mr. Atul Rahul, Mr. Manish Kumar Mandal, Ms. Ankita Singh, Ms. Deep Jyoti Singh, Mrs. Rashmi Srivas, Mr. Abhay Kumar, Mr. Amit Kumar Ram, Ms. Parul Rawat, Mr. Bablesh Jha, Mr. Rahul Singh, Mr. Nitesh Gupta, Mr. Gaurav Modanwal, Mr. Chandan Kumar, Mr. Raghu Ram and remaining all, for their support, cooperation and the memorable company during my stay at IIT(BHU), Varanasi.

I am incredibly grateful to many others out of my IIT campus for many unforgettable moments that I shared with them during my IIT (BHU), Varanasi stay, few of them are: Mr. Akash Kumar, Mr. Mukesh Kumar, Mrs. Sangeeta, Ms. Sonu, Ms. Sikha, Ms. Namrata, Ms. Bhawna and Mr. Rahul.

My thanks and sincere appreciations also go to all staff members of my department (Mr. Kamlesh Kumar, Mr. Ajit Kumar, Mr. Amar Srivastva, and Mr. Nitin Srivastva) of Department of Civil Engineering, Indian Institute of Technology (BHU), Varanasi for their help and efforts during my research work.

I heartily express sincere thanks to Mrs. Sumita Prasad, Mr. Umashankar Prasad who inspired me to live my life as per own choice and always support to take my own discussions. I would like to express my sincerest regards and love to my parents Mahesh Prasad and Sunita Devi, brother Ajeet Kumar and sister Sintu Kumari for their never-ending support, immense love, encouragement, inspiration, affection, and blessings throughout my life without which I could not have seen the light of the day. I also thank Mr. Prasun Raj Raushan, Mr. Aniket Kumar Sonu for their constant moral support.

Finally, I thank my supreme power, The GOD, for providing me the strength and blessing with everything I had ever esteemed for in every phase of my life.