Acknowledgements

At this moment of accomplishment, first and foremost, I owe my deepest gratitude to my research supervisor, Professor Samir Kumar Pal, for providing me the opportunity to work under his supervision. This work would not have been possible without his thoughtful guidance, warm encouragement, unconditional support, constant motivation, constructive criticism and inexhaustible help. I am extremely fortunate to have such an enthusiastic supervisor who sacrifices all his leisure for our academic success and always available to answer our queries despite his busy schedule. Sir has patiently provided guidance during the crucial moments in my work while simultaneously allowing me to express my ideas and work independently.

I am grateful to him for allowing me to explore new areas of research, interact and collaborate with talented researchers from a number of different national and international institutes. I also thank him for providing me with the opportunity to work with a talented team of researchers and an excellent research environment.

I would like to thank Prof. Peter Lemmens of TU Braunschweig, Germany, Prof. Joydeep Dutta of KTH Royal Institute of Technology, Sweden, Prof. Omar F. Mohammed of KAUST, KSA, Prof. Saleh A. Ahmed of Umm Al-Qura University, KSA, Dr. Hynd Remita of Université Paris-Sud, France, Dr. Srabanti Ghosh, CGCRI, India and Dr. Chinmoy Battacharya of IIFEST, India for fruitful collaborations.

I express my gratitude to all the faculty members and the staffs of S. N. Bose National Centre for Basic Sciences for their assistances in my research career. I acknowledge S. N. Bose National Centre for Basic Sciences for providing the research fellowship and Department of Science and Technology (DST), India for projects.

I’d like to express my sincere thanks to all my seniors and colleagues for providing a stimulating and enriching environment. Special thanks to Dr. Soumik Sarkar for helping me at the initial stage of my research work, I am also thankful to Siddhi di for helping me in the experiments related to biology. I am grateful to Nabarun for helping me out from many technical difficulties during my works related to solar cells. Special thanks to Jayita and Siddhi di for their assistance in formatting and proof-reading my thesis. My sincere appreciation goes to all my seniors: Dr. Abhinandan Makhal, Dr. Subrata Batabyal, Dr. Nirmal Goswami, Dr. Ranajay Saha, Dr. Tanumay Mondal, Dr. Surajit Rakshit, Dr. Anupam Giri, Dr. Soma Banerjee, Dr. Prasanna Kumar Mondal and all the present group members: Siddhi di, Nabarun, Susobhan, Prasenjit, Damayanti, Priya, Dr. Shreyasi Dutta, Tuhin, Jayita, Aniruddha, Probir, Ramesh and Soumendra da for providing a homely and a cheerful environment, and also for assisting me in research. A very special thanks to Nabarun and Susobhan with whom I shared many glorious moments over a long period of time. I will always miss their company in future. I also want to thank all my friends for the good times I shared with them. I pay tribute to all my teachers throughout my life.

Finally, I would like to pay high regards to my mother and all family members who support me through thick and thin, with love and affection. Without their sacrifices, moral support and blessings, this thesis would not have taken its shape.

Dated:
Department of Chemical, Biological and Macromolecular Sciences,
S. N. Bose National Centre for Basic Sciences,
Salt Lake, Kolkata 700106, India

(Samim Sardar)