# ACKNOWLEDGEMENTS

First I thank **God** almighty for given me the necessary strength to carry out the research work successfully and for guiding me in all the stages of this work.

It is a distinct pleasure to express my deepest sense of gratitude to my research supervisor, **Dr. B. Natarajan,** Assistant Professor, Department of Physics, Raja Doraisingam Government Arts College, Sivagangai for kindly suggesting me this challenging problem. His efficient guidance and constructive encourage me all along and helping through the course of the work. It was a privilege to carry out the present research work under him.

I record my heartfelt thanks to **Dr. M. Stalin Mano Gibson** Head of the Department of Physics, Department of Physics, Raja Doraisingam Government Arts College Sivagangai for moral support to finish this work successfully. I am thankful to **all faculty members and non-teaching staff** of the Department of Physics.

I express my sincere thanks to **Dr. V. Ramadas** Assistant Professor, Department of Zoology, Raja Doraisingam Government Arts College, Sivagangai for permitting me to use the research facilities for the Antibacterial study in the Department. He also agreed the valuable suggestions and innovative ideas to make improve my research work.

I am thankful to my beloved husband **Mr. A. Palanimurugan,** Lecturer, Research and Post Graduate Department of Chemistry, Raja Doraisingam Government Arts College, Sivagangai. I feel short of words to acknowledge his systematic and research approach blended with constructive criticism and innovative ideas that helped me to understand the basics of research and to overcome many experimental hindrances. I am gratuitous for his orgiastic interests and incessant support and could say that the present research venture has been possible due to his able guidance.

I would like to thanks **Dr. S. Thanikaikarasan** Assistant Professor/Selection Grade, Saveetha School of Engineering, Saveetha University, Chennai for his constant encouragement and valuable suggestions.

I express my sincere thanks to **Dr. S. Kalaiselvi** Assistant Professor, Department of Mathamatics, Mangayarkarasi College of Arts and Science for Women, Madurai for induces the theoretical based mathematical ideas through my work.

With immense pleasure, I record my deep sense of gratitude to my Doctoral committee members **Dr. N. Nataraj** and **Dr. S. Sankar,** Department of Physics, Bharathiar University, Coimbatore for their clever guidance, valuable advice and encouragement through the course of my research.

My profound thanks to **Dr. D. Gnanasekaran,** Director, Research & Development Centre, Bharathiar University, Coimbatore for his dedicated service and concern to research scholars.

I dedicate my grateful bouquet of emotional thanks to my most lovable Children's **(P. Genishiya, P. Rakhshith),** beloved parents **(AlagarsamyIndhirani, ArumugamMuniyammal),** brothers **(KannanJobikunyama, StalinSurya)** and sisters **(RajeshwariGovindharaj, KrishnaveniRadhakrishnan & Kavitha)** for giving me long standing moral support and encouragement during the strained.

A. DHANALAKSHMI

# ABSTRACT

In current years scientists have made rapid and major advances in the field of semiconductor physics. One of the most important fields of present interest in materials science is the fundamental aspects for applications of biological based nanomaterials. Several methods have been reported for the synthesis of nanomaterials, which include various inorganic, organic, biological systems that control size, shape and structure of nanostructures. Such methods that have been successful in producing other pure and well defined nanoparticles are still expensive. Characterization of nanomaterials very important for optimization of the various parameters involved during the synthesis of nanomaterials. In the present work deals, Investigation of Structural, Morphological, Optical and Antibacterial properties of Carbohydrate biotemplate and Transition metal doped Zinc Oxide Nanostructure materials and their results are discussed in the thesis systematically. The thesis is divided into 9 chapters and a brief description of content in each chapter is given below.

- **Chapter 1** provides an introduction about ZnO nanoparticles and ZnO thin films, objectives of the present work and the review of literature relevant to the studies.
- **Chapter 2** deals preparation and characterization techniques for the prepared nanoparticles and nanostructure thin films**.**
- **Chapter 3** provides synthesis and characterization of ZnO nanoparticles & ZnO nanostructure thin films from different Zinc sources and to optimize conditions were taken for the best quality of the samples.
- **Chapter 4** discussed that the Structural, optical and antibacterial efficiency of carbohydrate molecules (Glucose, Sucrose & Starch) bio-template of ZnO nanoparticles. This section gives the importance of bio-template molecules and the results obtained that the good bacterial resistics behavior in nature.

- **Chapter 5** presents Structural, morphological, optical and antibacterial activity of rod-like shaped Zinc oxide and Transition metals (Mn, Co & Ni) doped zinc oxide nanoparticles were providing efficient antibacterial property for TMs doped ZnO samples**.** The band gap energy was increased from 3.01 to 3.31 eV with addition of TM ions. The increases PL intensity decreases with interaction of transition metals and the increased optical band gap (vice versa) is attributed to the reduced crystallite size of TM-ZnO thin films.
- **Chapter 6** presents Structural, Optical and Improved Antibacterial effect using carbohydrate bio-template ZnO nanostructure thin films. The SEM study exhibited flower like morphology was obtained for ZnO sample and structure was modified influenced by the bio-templates of glucose, sucrose and starch. Hence, this work mainly focuses on film based antibacterial property of carbohydrates (Glucose, Sucrose & Starch) biotemplate ZnO thin films, deposited using SILAR technique.
- **Chapter 7** represents that the Structural, morphological, optical and improved antibacterial properties of Transition metal (Mn, Co & Ni) coated thin films prepared by SILAR method. The influences of TM doping on structural, optical and antibacterial properties were investigated. From this, concluded that as TMs doped ZnO thin film prepared enhanced antibacterial properties, it may be considered as a promising material for biomedical applications.

  **Chapter 8** deals the comparison of antibacterial activity for nanoparticles and nanostructure thin films using mathematical analysis. The mathematical analysis mainly focuses on the improved antibacterial property of selective inorganic and organic materials.

- **Chapter 9** presents the summary, conclusions and scope of our future work

# TABLE OF CONTENTS