Dedicated

to

All My Teachers

DECLARATION

I declare that the thesis entitled "**SOLVATION CONSEQUENCES OF DIFFERENT AQUEOUS MEDIA ON SOME BIOLOGICALLY ACTIVE COMPOUNDS: A PHYSICO-CHEMICAL STUDY**" has been prepared by me under the guidance of Prof. Biswajit Sinha (Principal Supervisor) and Prof. Mahendra Nath Roy (Co-Supervisor), Department of Chemistry, University of North Bengal. No part of this thesis has formed the basis for the award of any degree or fellowship previously.

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Anti-Plagiarism Report of the Ph.D Thesis

***Title of the Thesis*: SOLVATION CONSEQUENCES OF DIFFERENT AQUEOUS MEDIA ON SOME BIOLOGICALLY ACTIVE COMPOUNDS: A PHYSICO-CHEMICAL STUDY**

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interactions found in the solutions mixture. The activation parameters of viscous flow for the solutions mixture were also measured and expressed by the transition state theory applications.

Chapter VI The inspection of molecular interaction widespread in Allopurinol and in aqueous solutions of α-, β- and HP-β-cyclodextrin have been probed by thermophysical properties. The established complexes obtained were found to be hold with 1:1 stoichiometry. Role of solvent (aqueous solution of α-CD, □-CD, HP-β-CD) and contribution of solute–solute and solute–solvent interactions to solution complexes, have also been analyzed via stability constant-NMR, UV, Steady state Fluorescence, FTIR, HRMS, SEM, PXRD, Cytotoxicity, Hydrophobic effect, Hydrogen-bonding, structural effects in creation of inclusion complexes.

Chapter VIII The apparent molar volume (ϕ_V) of salicylaldehyde anil zinc(II) (abbreviated as SAZ) in N,N-Dimethylformamide (DMF), Dimethyl sulphoxide (DMSO) have been calculated from the measured experimental data on density at temperature, T= (298.15, 303.15, 308.15, 313.15 and 318.15) K. The partial molar volumes at infinite dilution, ϕ_V^0 and viscosity *B*-coefficients were also calculated. Again, apparent molar volume and density data were used to determine isobaric partial molar expansibilities (ϕ_E^0) and temperature dependence of ϕ_E^0 at constant pressure, $(\partial\phi_E^0/\partial T)_P$ of experimental solutions to study the different types of interactions in different solvents. The overall results indicate strong solute-solvent interactions of SAZ in both the solvents and hence SAZ acts as a net structure breaker in both the solvents.

Finally this thesis is end up with the conclusion in chapter no VIII with some remarks of the present work.

PREFACE

I began this present research work that is entitled as "**SOLVATION CONSEQUENCES OF DIFFERENT AQUEOUS MEDIA ON SOME BIOLOGICALLY ACTIVE COMPOUNDS: A PHYSICO-CHEMICAL STUDY"** in 2014 under the supervision of Prof. Biswajit Sinha (principal supervisor) and Prof. Mahendra Nath Roy (Co-supervisor) at the Department of Chemistry, University of North Bengal, India with an aim to investigate on the solution properties of some biologically active compounds in various aqueous media.

Since majority of the biochemical processes occur in aqueous medium, physico-chemical studies on the solution properties of biologically active molecules such as amino acids, carbohydrates, drugs, vitamins, alkaloids, nitrogen bases, and few electrolytes in aqueous media are very valuable, interesting and informative. Various type of molecular interactions, non-covalent interactions like hydrogen bonding, electrostatic and hydrophobic interactions, *etc* taking place on the aqueous solutions where these biologically active compounds as solutes and cosolutes.

The mechanism of action of biologically active compounds is quite complex and may include different possible intra and inter-molecular interactions. It is also found that molecular conformations correlate with biological activity of certain biologically active compounds. Hence, the information about the molecular interactions of such compound in aqueous media is benefit for understanding this mechanism of their actions. Different volumetric and viscometric properties like standard partial molar volumes and viscosity B-coefficients, adiabatic expansibilities *etc*., are very much beneficial in exploring of solute-solvent and solute-solute interactions. Therefore, thermodynamic and transport properties of aqueous solutions of these solutes are very much useful to knowing their mechanism of actions. So, the present research work is mainly focused on the physicochemical studies of some biologically active compound in different solvent media prepared in aqueous medium.

Acknowledgement

At the first opportunity I express my most sincere gratitude to my supervisor Prof. Biswajit Sinha and my Co- supervisor (Prof.)Dr. Mahendra Nath Roy for their proficient supervision through the splendid path of my research with great endurance. Constant support both of them, fruitful discussions and valuable suggestions at different stages are really a great motivation. The support and encouragement of all the other faculty members of the Department of Chemistry, University of North Bengal in the whole episode of my research was of colossal help. I am grateful to all the non-teaching staff of this department for their help during the crucial stage of my research.

My thanks to my past and present lab mates for their selfless help at different stages of my work. I also express my heartfelt gratitude to my parents for their selfless dedication to make me what I am today. My special thanks to my beloved wife Gargi Roy Mondal and to my sister Sushmita Mondal for their love, affection, support and encouragement during this period. The inspiration, encouragement and whole-hearted cooperation that I received from my friends, is most elegantly acknowledged.

I would also like to express my thankfulness to the Departmental Special Assistance Scheme under the University Grants Commission, New Delhi, India (DRS - SAP- III, No. F 540/12/DRS/2013) for financial and instrumental assistance. Above all the reason behind my glorification are due to God, without the grace of whom the whole procedure would have had condensed to nothing.

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