Preface

Increasing awareness toward the utilization of light in the green route synthesis of noble metallic nanomaterials has academic as well as technological interest. The use of light as a driving force in noble metal salt reduction provides an interesting tool for the generation of nanomaterials which is relatively green route as it uses photolight and utilize less number of chemicals. Numerous recipes are available for noble metallic nanostructures generation. However conventional synthetic methods, such as reduction by suitable reducing agent e.g. (NH_2–NH_2, $NaBH_4$), citrate reduction method, galvanic replacement method, polyol method etc are readily available. Utilizing harsh chemical reducing agent (NH_2– NH_2, $NaBH_4$), nanomaterials get contaminated with their counter ions e.g. BH_4^-, which make difficult to use these nanomaterials as an electrode modifiers for electrosensing applications. Another problem with this conventional reducing agent is that during the course of reaction, P^H of the reaction content changes abruptly, which is also one of the drawbacks of conventional method. Thousands of improved synthetic method of nanomaterials synthesis is being developed day by day as the research grows up. However, photochemical approach remains one of the less explored protocols as compared to other "bottom up chemical synthesis" of nanomaterials by using photochemically active molecules and its practical applications.

Recent development in wet chemical bottom-up synthesis offers an exciting opportunity for tailoring the bare electrode with nanomaterials for the advancement in chemically modified electrode for electrosensing applications. Considerable attention has been drawn during the last two decades to functionalize the hybrid nanomaterials on electrode surfaces by forming films of few nm to several µm thicknesses on the polycrystalline electrode surface for electrosensing devices applications. Thin film (nm/µm) of the desired material on the bare electrode surface is called chemically modified electrode and have a potential application in electro analytical techniques/ electrosensing device.

Still there is a scope for the photochemical assisted synthesis of nanomaterials by using photochemical active organic molecules in the applications of electrosensing of biologically & environmentally hazardous analytes. The intention of this thesis is to contribute the scientific findings investigated by us, keeping in view of all these regards, we have made an attempt to cover the overview of nanoscience, photochemical assisted synthesis of noble metallic nanomaterials and its characterizations to applications for amperometric sensing of hazardous analytes in the present thesis. We made best effort to illustrate comprehensibly the scientific findings in the thesis with appropriate justifications, figures, references etc. wherever required. Plenty of research activities on gold/silver nanomaterials have been seen during last three decades because of their attractive chemical, optical and electronic properties as well as biocompatibility which make it suitable and promising material for photoelectric devices, health & nutrition sciences, catalysis, bio-imaging and interestingly its applications as a electrode modifier for electrosensing applications. But still, there is area of interest in the "*room at the bottom*" research on "Small particles for solving Big Problem".

The focus of present thesis is to synthesize noble metallic nanomaterials with a different route (photochemical, i.e. green route) and connect these nanomaterials to nano electroanalytical chemistry which is a growing interdisciplinary field, combines characteristics of electrochemistry with unique properties of nanomaterials in the electrosensing applications. The present thesis fills this gap in the area of photochemical mediated synthesis of noble metallic nanomaterials and its applications in electrosensing of some of the specific biologically & environmentally hazardous analytes.

In the light of above context, outcomes of present research investigations are subdivided into seven chapters. First chapter is an introductory chapter, second chapter depicts the characterization Techniques: from working principle to instrumentation. The experimental findings of the present thesis are presented in chapter's third to sixth (taken from the research articles published by us). Each of these chapters begins with a brief review of literature relevant to the work presented in that chapter to put the appropriate outlook, materials and methods, results & discussion and followed by conclusions. Last chapter of the thesis i.e. seventh one, summarizing the concluding remarks/future scope of the presented investigations. Present thesis has compiled all of our *published results* in Journal of Materials Chemistry-01/RSC Advances-02/ChemElectroChem-01.