Preface

Electrochemical techniques are powerful and versatile analytical techniques that offer high sensitivity, accuracy, and precision as well as a large linear dynamic range, with relatively low-cost instrumentation. Electrochemistry is a well established and fast growing area with a number of possible applications in the pharmaceutical field. The improvement of quality of life has stimulated considerable research in drug design, bioavailability and safety. Thus, in order to achieve these targets, highly sensitive and specific methods of analysis are necessary. The society of today demands safe and cost effective manufacturing of a variety of high quality products with a minimum of negative effects on the environment. Electrochemical techniques are well suited for the determination of drugs in various samples, that is, raw material, pharmaceutical dosage forms even those involving a complex matrix such as syrups, tablets, creams, suppositories, or ointments or else in biological fluids. The principal advantage of the modern electrochemical methods is that the excipients do not interfere, and generally the separation and extraction procedure is not necessary.

Potentiometric sensors are an important class of electrochemical sensors in which the analytical information is obtained by converting the recognition process into a potential signal, which is proportional (in a logarithmic fashion) to the concentration (activity) of species generated or consumed in the recognition event. Such devices rely on the use of ion selective electrodes for obtaining the potential signal. The inherent selectivity of these devices is attributed to highly selective interactions between the membrane material and the target ion. Potentiometric sensors are very
attractive for field operations because of their high selectivity, simplicity and low cost.

The thesis presents the development, electrochemical characterization and analytical application studies of sixteen electrochemical sensors developed for six drugs viz., Trimethoprim, Ketoconazole, Lamivudine, Domperidone, Nimesulide and Lomefloxacin. Two different types potentiometric sensors have been developed in the study. These include both PVC membrane potentiometric sensor and carbon paste sensor.

Thus a total of 16 sensors have been developed. The thesis is divided into nine chapters.

A brief idea of the chapters is given below.

**Chapter 1** gives a general introduction on the various electroanalytical techniques and their application. The chapter gives an idea of the different types of chemical sensors and discusses in detail about electrochemical sensors. It also gives a brief review of the important potentiometric sensors developed for different drugs.

**Chapter 2** gives a brief sketch of the materials and methods used in the investigations. The general method for the synthesis of different ion associations and also the methods used for the fabrication of the two types of sensors are described in the chapter. It also gives an idea of the general procedure for the analysis of drug content in pharmaceutical formulations and also in real samples like urine. The instruments used in the present study are also discussed.
Chapter 3 describes the fabrication of two carbon paste sensors for the quantitative determination of Trimethoprim (TMP). The sensors incorporate the ion association of the drug with molybdophosphoric acid (MPA) and phosphotungstic acid (PTA) as electroactive materials. The analytical applications of the developed sensors in the determination of the drug in pharmaceutical formulations and real sample like urine was also clearly investigated.

Chapter 4 deals with the development of two novel electrochemical sensors for the determination of the drug Ketoconazole (KET) based on KET-MPA (molybdophosphoric acid) ion pair as the electroactive material. The electrochemical response characteristics are described in detail and the application study of the developed sensors in the determination of the drug in pharmaceuticals and urine samples have also been dealt with in detail.

Chapter 5 deals with the development of sensors for the drug Lamivudine (LAM) based on the ion pair complexes of the drug with molybdophosphoric acid (MPA) and phosphotungstic acid (PTA). The response parameters of the newly developed sensors as well as their analytical applications have been discussed clearly in this chapter.

Chapter 6 presents the fabrication and response behaviour of the sensors developed for the drug Domperidone (DOM) based on the ion association complex DOM-PTA (phosphotungstic acid). The analytical applications of the developed sensors in the determination of pharmaceutical formulations and real samples have also been discussed in this chapter.
Chapter 7 deals with the development of sensors for the drug Nimesulide (NIM) based on the ion pair complexes of the drug with molybdophosphoric acid (MPA) and silicotungstic acid (STA). Optimization of membrane and carbon paste composition, response characteristics and analytical applications are dealt with in detail in this chapter.

Chapter 8 discusses the development and performance characteristics of membrane sensors for the drug Lomefloxacin (LOM) based on the ionophores LOM-STA and LOM-MPA. The application studies of the developed sensors in the determination of the drug in pharmaceutical formulations and urine samples are also explained in the chapter.

Chapter 9 presents the summary and important conclusions of the work done.

References are given as a separate section at the end of the thesis.