MODERN TECHNIQUES AND NEW SENSORS FOR CHARACTERIZATION AND DETERMINATION OF SOME IONIC SPECIES AND ENVIRONMENTAL POLLUTANTS

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DEDICATION

To the Muslims-brotherhood, specially whom are kept behind the bars for nothing but calling for love, just and honor.

I. H. A. Badr

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ABSTRACT

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The studies presented in this dissertation were designed to develop novel anion sensors for environmentally and clinically relevant species. In addition, understanding the response mechanism of the anion-ionophore interactions was one of the fundamental aims of this dissertation.

In this work, novel liquid polymeric membrane anion sensors were developed utilizing metal ion-complexes as anion carriers. In chapter two, lipophilic palladium(II)organophosphine complexes were employed as nitrite carriers in polymer membrane. Such sensors exhibit significantly enhanced response towards nitrite with selectivity deviates clearly from the Hofmeister pattern. A highly selective HBHA (a drug used as anti-kidney stones) liquid/polymer membrane electrode based on Sn(IV)porphyrin is described in chapter IV.

The response mechanisms of the developed sensors were studied in detail. A dual charged/neutral carrier mode mechanism was proposed for benzylbis(triphenyl)phosphine based nitrite sensor. In chapter III, a unique potentiometric response mechanism is postulated for the sulfite sensor based on Hg(II)dithiocarbamates. Such postulated redox mechanisms

were supported by a host of experimental evidences such as the effect of lipophilic ionic additives on potentiometric selectivity.

Finally, the optimum set up suitable for analytical applications of the developed membrane systems was studied. For instance, sulfite sensor was used in FIA mode to quantitate sulfite in beverage samples, HBHA sensor was used to assay HBHA-drug in its pharmaceutical preparation, and tetraphenylborate sensors (chapter V) were used to monitor separate and sequential titrations of alkaline earth and transition-metal ions.

Key words:

Ion-Selective Electrodes, Polymer Membrane Electrodes, Anion Sensors, Drug Sensors, Response Mechanism, Flow-Injection Analysis, Potentiometric Titration, Mercury(II)Dithiocarbamate Complexes, Palladium(II) Organo-Phosphine Complexes, Metalloporphyrins, Sulfite/Hydrogen Sulfite, Nitrite, 2-Hydroxybenzhydroxamate, Tetraphenylborate.

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