International Conference & Exihibition on
Analytical and Bioanalytical Techniques 2010
ANANBIOANAL - 2010
Pharmaceutical R & D Summit
doi:10.4172/2155-9872.1000096

Wide Scope of Polymeric Membrane Based Ion Selective Electrodes

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Ion Selective Electrodes (ISEs) are the chemical sensors of longest history and probably the most frequent routine application. The most commonly used ion selective electrode is the pH described it in 1906. By the mid 1960's the Orion Research Inc was producing calcium electrodes for the use in blood gas analyzers (Frant 1994). Since then numerous electrodes has been developed for the analysis of samples containing many different ions. A chemical sensor detects the presence of specific chemical or class of chemical in any sample. These are miniaturized analytical devices, which can deliver real-time and on-line information on the presence of specific compounds or ions in complex samples. Usually the analyte recognition takes place followed by the conversion of chemical information into an electrical or optical signal.

The basic ISE setup includes a potentiometer, a probe (selective for each analyte of interest) and various consumables used for the pH or an ionic strength adjustment, which makes the cost of initial setup low as compared to other techniques. ISE determinations are not subject to interferences such as colour in the sample. Thus in past two decades, there has been a growing interest in search for ionophores (electroactive material) that can chemically recognize specific ion and offer either new or improved selectivity for different ions. The limited availability of such materials makes it difficult to develop efficient sensors and hence this is a demanding field of research.

ISEs now being exploited as detectors in flow injection analysis systems. In such systems, the dynamic behaviour of an ISE assumes great importance, since this will determine the signal shape and the sampling rate. Characterizing the dynamic behaviour of ISEs constitutes the third area of advancement in this research field. Physiological and biological applications of ISEs have been a goal since the inception of the field. Miniaturization in instrumentation seems to be the current paradigm in the ISEs study which leads to the development of microelectrodes for intracellular measurements of ion activities. Finally, commercial application of these electrodes is the major area to be worked upon.