Selectivity of solid-contact Ag potentiometric sensors based on thiacalix[4]arene derivatives

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ABSTRACT

Potentiometric sensors based on glassy carbon electrode covered with polyani containing amidopyridine, morpholide, pyrrolidide and hydrazide function cone and 1,3-alternate conformations have been developed and applied for in the range from 1.0×10^{-2} to 4.0×10^{-7} M and limits of detection from 1 sensitivity of Ag^+ detection decreases in the following range of thiacalix[4 pholide > pyrrolidide > amidopyridine > hydrazide. Potentiometric selectivity showed binding of Ag^+, Hg(II) and Fe(III) ions over other transient and alkali me tional groups and conformation of receptor on the selectivity of the sensor res shown, selectivity and sensitivity of Ag^+ determination depends on the steri ing site and flexibility of the receptor structure. For Fe(III) ions, changes of th determined by their implementation in redox reactions of polyaniline.

1. Introduction

The interest to the development of novel potentiometric sensors and their application in biology, medicine, environmental monitoring, industry and agriculture is currently stimulated by the advantages they possess, i.e. low cost, simple operation, flexible production, a wide range of concentrations to be determined, adequate sensitivity and selectivity [1]. Current research activity in this area includes the construction of maintenance-free sensors with high stability of the response and diverse selectivity toward analytes [2,3]. This can be achieved by combination of novel neutral ionophores with conducting polymers which provide ion-to-electron transduction and can be used as a matrix for incorporating the specific receptors or other additives entrapped into the polymer film due to electrostatic interactions.

Polyaniline (PANI) [4–7], polythiophene derivatives [8–11], polypyrrole [7,11–14] polyanisidine [7], polycarbazole [15] were investigated in the assembly of solid-contact potentiometric sensors. For PANI, strong pH-sensitivity of its potential can limit its sensor applications. However, the use of additional polymeric membranes with lipophilic salts and PANI incapsulation as well as introduction of substituents at nitrogen atom of the polymeric chain partially diminish the pH depende increase its reversibility [16–20].

Among other ionophores, substituted ca analogs have been intensively investigated as recognition elements toward inorganic species [21–23]. The calixarene moiety esta coordination of the binding sites and her control the reactivity and selectivity of the organic and inorganic compounds. Thus taining pendant ether, ester, amide and k mono- and bis-calix(crowns) exhibit a se alkali-earth metal ions [24–27]. The intr nitrogen atoms into the substituents incr the calixarenes with soft transient metal ubstituted arylamide [28] and tetrasubstit [29] calix[4]arenes show selective bindin parison with parent calixarenes, thiacali opportunities for binding metal ions whic bridging sulfur atoms [30]. Recently, a nur calixarenes with π-coordinating centers wa of potentiometric selectivity for Ag(I) deter limit of 3×10^{-11} M was found for bridged t tiometric measurements [31]. Unsubstitut *p-tert*-butylthiacalixarene were deposited onto the gold electrode and active part Cu(II) determination [32–34]. Sulfonated th were applied for pre-column concentrati

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