

عنوان مقاله:

Preparation of electrochemical sensor base on carbon paste electrode modified by a new pentazene ligand for determination of mercury in aqueous samples

محل انتشار:

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خلاصه مقاله:

As one of the most toxic heavy metals, mercury pollution has attracted much attention in environmental and toxicological domains for decades. Inorganic mercury released mainly from industrial sources can be further converted into methylmercury by microorganisms and fish. Methylmercury, the most common organic mercury, is more toxic than inorganic mercury because it's lipophilic and easily absorbed by aquatic organisms which finally bioaccumulate in the human body through the food chain leading to severe impact on human health due to its severe toxicity to the nervous and immune system [1]. Nowadays, different schemes have been reported for detection of water-soluble Hg^{2+} ion, e.g., colorimetric assay, electrochemical method, inductively coupled plasma mass spectroscopy (ICPMS) and fluorescence spectroscopy. Among the methods, electrochemistry holds great potential as the next-generation detection strategy because of its high sensitivity, low cost, low power requirements and simple instrumentation [2]. In this study, a new ligand, 1,5-bis(4-methoxyphenyl)-3-methyl-1,4-pentazadiene (b-PMMP) (figure 1) has been synthesized by reaction of the 4-methoxyaniline (p-anisidine) with methanamine (methylamine). The mixture was stirred in an ice bath for 30 min. The structure of the synthesized compound resulted from the IR and 1H NMR and ^{13}C NMR. Afterwards, a carbon paste electrode modified with a this new ligand was developed for the mercury determination at nanomolar level concentration. The electrochemical behavior of this molecule was investigated employing cyclic voltammetry and square wave voltammetric. The experiments were conducted with a certain electrode composition of 18.0% paraffin oil, 70.0% high purity graphite powder and 12.0% b-PMMP as well as the usage of pH=10 ammonia buffer as supporting electrolyte. Also the enhanced peak current response is a clear evidence of the modified carbon paste electrode towards oxidation of mercury. The effect of pH and scan rate on the electrode process was investigated. The method was successfully applied to the determination of water-soluble Hg^{2+} ion in environmental samples. resulting electrode demonstrated linear response across a wide mercury concentration range. The method was successfully applied to the determination of water-soluble Hg^{2+} ion in environmental samples.

کلمات کلیدی:

Carbon paste electrode, pentazadiene, Mercury, Electrochemical sensor

