

عنوان مقاله:

A platinum electrode modified with multi-walled carbon nanotubes, chitosan and bismuth film as an electrochemical sensor for Cd (II), Hg (II), Pb (II) and Zn (II) simultaneous determination

محل انتشار:

چهارمین کنفرانس بین المللی نوآوری های اخیر در شیمی و مهندسی شیمی (سال: 1396)

تعداد صفحات اصل مقاله: 2

نویسندگان:

Mostafa Khoramnia - *Department of Food Hygiene and Quality Control, Faculty of Veterinary Medicine, Urmia University, Urmia, Iran- Department of Bioelectrochemistry, Institute of Biotechnology, Urmia University, Urmia, Iran; Bank Keshavarzi, Iran*

Hossein Tajik - *Department of Food Hygiene and Quality Control, Faculty of Veterinary Medicine, Urmia University, Urmia, Iran-Department of Medicinal and Industrial Plants, Institute of Biotechnology, Urmia University, Urmia, Iran*

Reza Emamali Sabzi - *Department of Chemistry, Faculty of Science, Urmia University, Urmia, Iran; Department of Bioelectrochemistry, Institute of Biotechnology, Urmia University, Urmia, Iran*

Abdollah Salimi - *Department of Chemistry, Faculty of Science, University of Kordestan, Sanandaj, Iran*

خلاصه مقاله:

As heavy metal ions severely harm human health, it is important to develop simple, sensitive and accurate methods for their detection in environment and food. Electrochemical detection and determination featured with short analysis time, low power cost, high sensitivity and easy adaptability for in-situ measurement is one of the most developed methods. In this work a platinum electrode modified with multi-walled carbon nanotubes, chitosan and the bismuth film was fabricated and used to simultaneously determine cadmium, mercury, lead and zinc. At first, the surface of the platinum electrode was cleaned using sandpaper, alumina, deionized water and an ultrasonic device. As the next step, in order to modify of the electrode surface, modified MWCNTs and chitosan composite was coated on the clean and dried surface. Then, using chronoamperometry technique the bismuth was covered on the composite film by $E = -0.8 \text{ V}$, $t = 40 \text{ s}$. After that deoxygenation was applied to the solution using nitrogen gas in order to get the most sharpness mercury peak, then preconcentration step started using chronoamperometry technique. After rest time at the end step, anodic stripping voltammetry was applied using differential pulse voltammetry technique. All of the experimental conditions were optimized, the modified electrode was then applied to the analysis of Cd (II), Hg (II), Pb (II) and Zn (II). The linear range of the electrode was $0.0003303\text{--}0.006098 \mu\text{M}$ for Cd (II), $0.000588\text{--}0.004839 \mu\text{M}$ for Hg (II), $0.055\text{--}0.23 \mu\text{M}$ for Pb (II) and $0.005\text{--}0.064 \mu\text{M}$ for Zn (II). The determination of Cd (II), Hg (II), Pb (II) and Zn (II) in the meat of rainbow trout fish were performed and gave satisfactory results in accordance with atomic absorption spectroscopy results. This modified electrode can be self-designed and prepared easy with low costs. This novel sensor can detect and determine 4 toxic metals simultaneously with high accuracy and sensitivity in minimum time.

کلمات کلیدی:

Platinum electrode, MWCNTs, chitosan, bismuth film, heavy metals, anodic stripping voltammetry

