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Abstract

Voltammetric Detection of Mercury Ions at Poly(azulene-EDTA)-like Screen Printed Modified Electrodes †

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Abstract: In recent years, many applications have been developed for the detection of different toxic metals (As, Cd, Cu, Hg, Ni, Pb) in water samples. The classic analytical methods (ICP-MS, AAS with graphite furnace, ICP-EOS with ultrasonic nebulizer) not only require a longer analysis time (pretreatment of the sample and analysis), but also the costs involved are higher as a result of expensive equipment, costs associated with the method validation process and qualified staff. The use of modified electrodes for trace metals analysi from wastewater samples represents a modern approach which can provide accurate, fast results with selectivity and sensitivity. Thus, here we present the development of the previously obtained glassy carbon-modified electrodes based on poly(2,2′-(ethane-1,2-diylbis(2-(azulen-2-ylamino)-2-oxoethyl)azanediyl))diacetic acid, (polyL) in laboratory-scale studies. In order to analyze Hg(II) ion content from aqueous samples, an assembly system made of carbon screen-printed modified electrodes (SPEs) modified with polyL selective complexing polymeric films coupled with a portable potentiostat was used. The detection of Hg(II) ions was accomplished by chemical accumulation in an open circuit followed by anodic stripping using the differential pulse voltammetry technique. The calibration curve of the analytical method was situated in the range of 20 ppb to 150 ppb ($y = 0.0051x + 0.123$, $R^2 = 0.9951$), with a detection limit of 6 ppb. The precision value for the lower limit of the calibration curve was 20%, while for the upper limit, the value was 10.5%. The novelty of the method consists not only of the low cost of the analysis, but also of the possibility to provide real-time reliable information about the Hg(II) concentration in wastewater using a small and portable device.

Keywords: complexing polymer; modified electrode; voltammetric detection; mercury analysis

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