A Highly Sensitive and Selective Electrochemical Mercury(II) Sensor Based on Nanoparticles of Hg(II)-imprinted Polymer and Graphitic Carbon Nitride (g-C₃N₄)

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Using nanoparticles of an ion imprinted polymer an electrochemical sensor was designed for mercury(II) ions. Nanoparticles of the Hg(II)-imprinted polymers were formed using a functional monomer (itaconic acid) through the precipitation polymerization approach. These particles were characterized using FT-IR, TGA and SEM. The particles together with graphitic carbon nitride (g-C₃N₄) were then used to modify a carbon paste electrode (CPE) and the modified electrode was used for the analysis of Hg(II). The analysis method involved a first step of includes accumulating Hg(II) on the modified electrode under open circuit conditions, followed by is a second step of reducing of the mercury(II) ions to Hg under a negative pre-potential, and a final third step of generating the electrochemical signal through a square wave anodic stripping voltammetry (SWASV) routine. The obtained results were compared with those of an unmodified CPE, and it was found that the modified CPE has a higher tendency for Hg(II) ions. The effect of the presence of g-C₃N₄ was also evaluated. The modified electrode was found to have a suitable linear response from 0.06 to 25.0 nM, and a lower detection limit (S/N=3) of 18 pM under optimal conditions and its performance was also checked for the analysis of Hg(II) in water samples.

Keywords: Mercury ion, ion-imprinted polymers, Nanoparticles, Graphitic carbon nitride (g-C₃N₄), Electrochemical sensor, Square wave voltammetry

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