Development and characterization of a home-made nanostructured gold electrode. Evaluation of its applicability for mercury determination in fish

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The applicability to the determination of mercury in tuna of square wave anodic stripping voltammetry (SW-ASV) conducted at both solid gold electrode (SGE) and a home-made gold nanoparticle-modified glassy carbon electrode (AuNPs-GCE)[1] was demonstrated. Gold is an excellent material for Hg determination since it exhibits a high affinity for Hg, thereby improving the effects of pre-concentration before stripping. Metal nanoparticles can be exploited in electroanalysis for their ability to catalyze the redox processes, since they facilitate the electron transfer; moreover, the large surface area of the deposited nanoparticles could permit an improvement of the analytical performance. Morphological characterisation of the AuNPs-GCE surface was carried out by scanning electron microscopy (SEM) and the roughness of the obtained AuNPs-layer was investigated by Atomic Force Microscopy (AFM).

Mercury content in two certified materials (*Tuna Fish BCR 463* and *Tuna Fish ISPRA T-22*) and in ten samples of canned tuna was measured. The obtained electrochemical values were compared with direct mercury analyser (DMA) to better assess the advantages and drawbacks of the possible alternative approach for Hg determination. The results pointed out that both SW-ASV approaches can be considered suitable, easy and alternative methods to monitor mercury concentration in tunas, since they allowed to reach accurate quantification at concentration values lower than the maximum admissible level in this matrix ([Hg] = 1 $mg/kg_{wet\ weight,ww}$). In particular, mercury detection at the AuNPs-GCE showed a LOQ in fish-matrix of 0.1 μg/l, corresponding to 0.06 mg/kg_{ww}, with performance comparable to that of DMA.[2]

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References:

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