A novel electrochemical sensor based on B doped CeO2nanocubes modified glassy carbon microspheres paste electrode for individual and simultaneous determination of xanthine and hypoxanthine

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Abstract:

A novel electrochemical sensor based on the use of boron doped CeO2nanocubes modified glassy carbon microspheres paste electrode (B-CeO2NCs/GCPE) was prepared and applied for selective and sensitive determination of xanthine (XA) and hypoxanthine (HXA) individually and simultaneously. The morphology, composition and structural properties of the undoped and B doped CeO2nanocubes were characterized by X-ray diffraction, energy-dispersed X-ray spectrometry (EDS) and transmission electron microscopy (TEM). Electrochemical activities and the surface analysis of the modified electrodes were investigated using scanning electron microscopy (SEM) and cyclic voltammetry (CV). From the B-CeO2NCs/GCPE, well oxidation peaks and enhanced peak currents of XA and HXA were observed owing to the excellent catalytic activity of B-CeO2NCs. For individual detection, the linear responses of XA and HXA were in the concentration range of 5.42 × 10⁻⁸–1.31 × 10⁻⁵M and 3.98 × 10⁻⁷–6.01 × 10⁻⁵M with detection limits of 3.02 and 6.17 nM, respectively. For simultaneous detection by synchronous change of the concentration of XA and HXA, the linear ranges were 1.98 × 10⁻⁷–9.45 × 10⁻⁶M and 3.98 × 10⁻⁷–1.28 × 10⁻⁵M with detection limits of 3.65 and 8.17 nM, respectively. The practical application of the modified electrode was demonstrated by simultaneously determining the concentrations of XA and HXA in human biological fluids and in fish meat samples with satisfactory results.

Keywords:

Xanthine, Hypoxanthine, Biological fluids, Fish meat, Simultaneous detection, Nanocubes sensors

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