Electrochemical sensor for individual and simultaneous determination of guanine and adenine in biological fluids and in DNA based on a nano-In-doped ceria modified glassy carbon paste electrode

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Abstract:

A novel, simple and sensitive electrochemical method for individual and simultaneous determination and direct electro-oxidation behaviors of guanine (G) and adenine (A) was developed using an In doped ceria nanoparticle modified glassy carbon paste electrode (In–CeO2/GCPE). Scanning electron microscopy (SEM) and electrochemical techniques were employed for characterization of the fabricated modified electrode. The electrochemical sensor exhibits a potent and persistent electro-oxidation behavior followed by well-separated oxidation peaks toward G and A. Electrochemical performances related to the electro-oxidation of G and A at the nano-In–CeO2NPs/GCPE were investigated, showing that their peak currents were greatly enhanced due to the catalytic effect of In doped ceria. The prepared In–CeO2NPs/GCPE showed high selectivity and sensitivity for G and A oxidation over uric acid (UA). A linear range of 0.07–34 mM with a detection limit of 1.19 ̊ 10⁻⁸ M for G and 1.96–88.2 mM with a detection limit of 2.86 ̊ 10⁻⁸ M for A were achieved. The proposed sensor was used for individual and simultaneous determination of G and A in biological fluids and in ssDNA samples. The value of (G + C)/(A + T) in DNA was calculated to be 0.75.

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