A versatile sensor for determination of seven species based on NiFe nanoparticles

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A versatile sensor for determination of seven species based on NiFe nanoparticles

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Abstract

A facile one-pot route was developed to synthesis NiFe bimetallic nanoparticles via a controlled co-reduction of Ni(II) acetylacetonate and Fe(II) acetylacetonate in oleylamine (OAm). Due to its unique properties originating from the synergistic effects of transition metals, NiFe exhibited excellent electrochemical catalytic activities. The electrochemical sensor based on carbon supported NiFe nanoparticles (NiFe/C) was constructed to determine various small biomolecules, and intensively showed high selectivity toward the oxidation of ascorbic acid (AA), dopamine (DA), uric acid (UA) and four DNA bases (guanine (G), adenine (A), thymine (T) and cytosine (C)), with large peak separations of 179 mV (AA-DA), 123 mV (DA-UA), 128 mV (G-A), 274 mV (A-T), 112 mV (T-C) and little mutual interference. The detection limits were AA (1.0 μM), DA (0.1 μM), UA (0.1 μM), G (0.25 μM), A (0.25 μM), T (10 μM) and C (10 μM) at S/N = 3, respectively. The feasibility of the proposed sensor for real sample analysis was also investigated. These results demonstrate that NiFe bimetallic catalyst is a promising candidate of electrode material for determination of various analytes, which make it a fascinating sensor with versatile application.

Keywords:

Electrochemical sensor; One-pot synthesis; NiFe; Simultaneous determination; DNA