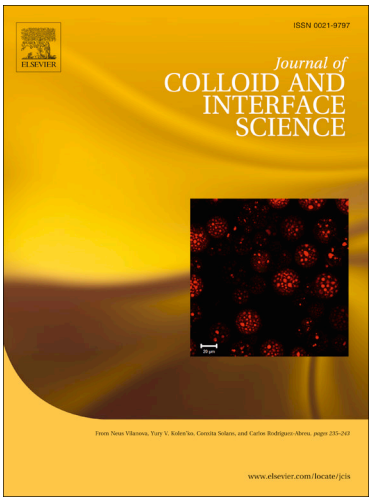

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Microstructured Prealloyed Titanium-Nickel Powder As a Novel Nonenzymatic Hydrogen Peroxide Sensor

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Abstract

At present, commercial pure Titanium (Ti) and microstructured pre-alloyed Titanium-Nickel (TiNi) powders are employed as a sensitive electrochemical hydrogen peroxide (H_2O_2) sensor. Surface characterization of these materials are performed by x-ray diffraction (XRD) and scanning electron microscopy (SEM). The electrochemical characterization is achieved via cyclic voltammetry (CV), chronoamperometry (CA), and electrochemical impedance spectroscopy (EIS) on Ti and TiNi modified glassy carbon electrode (GCE). The electrochemical behavior of H_2O_2 at the pure Ti/GCE and microstructure pre-alloyed TiNi/GCE are studied by CV in 0.1M phosphate buffer solution (PBS) containing as the supporting electrolyte. In addition, CA is employed for the determination of H_2O_2 at the applied potential of 0 V vs. Ag/AgCl. The sensor has a linear response range of 0.5 mM to 17.5 mM with a sensitivity of 280 $\mu A m M^{-1} cm^{-2}$. Moreover, the limit of detection (LOD) and limit of quantification (LOQ) are 0.5 µM and 1.7 µM, respectively. The electrochemical sensor exhibits fast and selective responses to H_2O_2 concentration. The applicability of the sensor is checked using a hair coloring as a real sample with satisfactory results.

Keywords: microstructured TiNi, alloy, hydrogen peroxide, sensor, hair coloring, amperometry