

## Accepted Manuscript

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PII: S0928-4931(17)34348-5  
DOI: doi:[10.1016/j.msec.2018.08.068](https://doi.org/10.1016/j.msec.2018.08.068)  
Reference: MSC 8862  
To appear in: *Materials Science & Engineering C*  
Received date: 4 November 2017  
Revised date: 3 August 2018  
Accepted date: 31 August 2018

Please cite this article as: Fahimeh Zeraatkar Kashani, Sayed Mehdi Ghoreishi, Asma Khoobi , Experimental and statistical analysis on a nanostructured sensor for determination of p-hydroxybenzoic acid in cosmetics. Msc (2018), doi:[10.1016/j.msec.2018.08.068](https://doi.org/10.1016/j.msec.2018.08.068)

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## Experimental and statistical analysis on a nanostructured sensor for determination of *p*-hydroxybenzoic acid in cosmetics

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### Abstract

In this research, differential pulse voltammetry (DPV) coupled with experimental design, was used for determination of *p*-hydroxybenzoic acid (PHB) in cosmetics. Optimization of effecting parameters was carried out based on rotatable central composite design (RCCD) and response surface methodology (RSM) at the surface of a nanostructured electrode for achieving the best sensitivity. Sol-gel process was used for synthesise of nickel titanate (NiTiO<sub>3</sub>) nanoceramics. The structural and morphological characterization of the nanoparticles was studied by X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FT-IR) and scanning electron microscopy (SEM). Then the NiTiO<sub>3</sub> nanopowders were used for surface modification of a carbon paste modified electrode (CPE). Surface characterization of the electrode was accomplished using SEM, electrochemical impedance spectroscopy (EIS) and cyclic voltammetry (CV) techniques. Under the optimized conditions, the voltammograms exhibited two linear dynamic ranges of 0.7-80.0 μM and 80.0-1000.0 μM for PHB with the detection limit of 62.0 nM (S/N = 3). Finally the NiTiO<sub>3</sub> nanoceramics modified carbon paste electrode (NiTiO<sub>3</sub>/CPE) could be employed for the determination of PHB in real samples with satisfactory results.

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