

## Documents

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**Development of an Aluminium Doped TiO<sub>2</sub> Nanoparticles-modified Screen Printed Carbon Electrode for Electrochemical Sensing of Vanillin in Food Samples**

(2018) *Electroanalysis*, 30 (5), pp. 969-974.

**DOI:** 10.1002/elan.201800032

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**Abstract**

A new chemically modified electrode based on titanium dioxide nanoparticles (TiO<sub>2</sub>-NPs) has been developed. Aluminium was incorporated into the TiO<sub>2</sub>-NPs to prepare aluminium doped TiO<sub>2</sub> nanoparticles (Al-TiO<sub>2</sub>-NPs). Aluminium doped TiO<sub>2</sub> nanoparticles-modified screen printed carbon electrode (Al-TiO<sub>2</sub>-NPs/SPCE) was employed as easy, efficient and rapid sensor for electrochemical detection of vanillin in various types of food samples. Al-TiO<sub>2</sub>-NPs were characterized by energy-dispersive X-ray (EDX), transmission electron microscopy (TEM), and X-ray diffraction (XRD) and analyses showing that the average particle sizes varied for the Al-NPs (7.63 nm) and Al-TiO<sub>2</sub>-NPs (7.47 nm) with spherical crystal. Cyclic voltammetry (CV) and linear sweep voltammetry (LSV) were used to optimize the analytical procedure. A detection limit of vanillin was 0.02 µM, and the relative standard deviation (RSD) was 3.50 %, obtained for a 5.0 µM concentration of vanillin. The electrochemical behaviour of several compounds, such as vanillic acid, vanillic alcohol, p-hydroxybenzaldehyde and p-hydroxybenzoic, etc., generally present in natural vanilla samples, were also studied to check the interferences with respect to vanillin voltammetric signal. The applicability was demonstrated by analysing food samples. The obtained results were compared with those provided by a previous method based on liquid chromatography for determination of vanillin. © 2018 Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim

**Author Keywords**

Aluminium doped TiO<sub>2</sub> nanoparticles; electrochemical detection; food samples; screen-printed carbon electrode; vanillin

**Publisher:** Wiley-VCH Verlag

**ISSN:** 10400397

**CODEN:** ELANE