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Abstract

Poly(methylene blue)-Film-Coated Carbon and MWCNT Screen-Printed Electrodes for Tyramine Detection †

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Abstract: Tyramine is a known biogenic amine commonly found in some fermented foods and beverages. The consumption of large amounts of food contaminated with tyramine can cause food poisoning and severe allergic reactions in the human body. A healthy person can intake about 200–800 mg in a single oral intake. However, higher concentrations of tyramine can cause food poisoning and health problems if this concentration is exceeded. In this case, it is extremely important to detect and quantify the tyramine content in food samples to ensure food quality. In the present work, we developed a poly(methylene blue) film, (PMB)-modified carbon and multi-walled carbon nanotube (MWCNT) screen-printed electrode for rapid and timely tyramine analysis. The proposed sensor was used for the oxidation of tyramine using electrochemical techniques such as cyclic voltammetry and differential pulse voltammetry (DPV). The electrochemical techniques were performed with tyramine under optimal conditions, including the supporting electrolyte, pH, working potential window, and scan rate. The PMB-modified electrode showed an oxidation potential of tyramine of 0.68 V in phosphate-buffered solution (0.1 M PBS, pH 7.4) at a scan rate of 50 mV/s. The plain screen-printed electrode showed an oxidation potential of tyramine of 0.9 V with a lower current response under the same experimental conditions. The modified method could detect tyramine over a wide linear range from 0.29 µM to 3.3 µM via DPV and 9.9 µM to 48.53 µM via cyclic voltammetry, with a low detection limit of 0.096 µM (S/N = 3). Based on the voltametric results, it was concluded that the developed modified electrodes provide accuracy, rapid analysis, selectivity, and reproducibility for tyramine analysis.

Keywords: conducting polymers; screen-printed electrodes; electrochemical sensor; tyramine; poly(methylene blue)

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