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Platinum Nanoparticles and Carbon Nanopolymer Composite as Sensor for Highly Sensitive Determination of Salbutamol in Pork Meat and Pork Liver

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A metal-carbon nano-polymer based sensor was constructed by combining platinum nanoparticles (PtNPs), acidified multi-walled carbon nanotubes (MWCNTs), and a ionic polymer of perfluorinated sulfonic resin (PFSE) for modifying on the surface of glassy carbon electrode (GCE), yielding PtNPs/MWCNTs-PFSE/GCE. The behaviors of cyclic voltammetry (CV) and differential pulse voltammetry (DPV) of four different modified electrodes such as bare GCE、MWCNTs-PFSE/GCE、PtNPs/GCE and PtNPs/MWCNTs-PFSE/GCE were investigated in detail, showing that the PtNPs/MWCNTs-PFSE composite exhibited significantly improved electrocatalytic activity to salbutamol (SAL, **1**). An oxidation mechanism has been confirmed that the phenolic hydroxyl group of SAL (**1**) is oxidized involving one proton and one electron for a formation of a free radical, resulting in intermediate (**2**) via resonance, and then transform to a SAL dimmer (**3**) with a C-C bond formation via re-combination of the intermediate (**2**), showing an irreversible oxidation process. Under the optimum condition, the metal-carbon nano-polymer modified electrode showed excellent linear response to SAL in range of from 5.0×10^{-8} mol/L to 2.0×10^{-6} mol/L and a detection limit of 1.4×10^{-8} mol/L. The modified electrode possessed good selectivity, reproducibility, and stability. This has been successfully applied to determination of SAL content in pork meat and pork liver samples with recovery rates from 95.4% to 104.3%, indicating strong potential applications in food safety control.

Keywords: Salbutamol; Metal-carbon nano; Perfluorinated sulfonic resin; Pork meat and pork liver; Food safety

FULL TEXT