Voltammetric Determination of Sudan I by Using Bi₂WO₆ Nanosheets Modified Glassy Carbon Electrode

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The as-synthesized nanomaterials have been completely characterized by X-ray powder spectroscopy, frontier infrared spectroscopy, Raman spectroscopy, scanning electron spectroscopy, energy dispersive spectroscopy, and mapping analysis as well as electrochemical measurements. The structural and morphological characterizations show the sheet-like structure of bismuth-doped tungsten oxide. The as-synthesized Bi₂WO₆ nanosheets were utilized for the electrochemical determination of Sudan I. The results confirm that the bismuth-doped material has enhanced electrocatalytic activities compared to the undoped tungsten oxides. Furthermore, the reaction kinetics of the electrochemical oxidation of Sudan I using the Bi₂WO₆ modified electrode surface was a diffusion-controlled process, and which involves two-proton and two-electron transfer mechanisms. The analytical measurements were employed by DPV techniques under optimal conditions, and thus shows a wide linearity range of 0.02 to 114.6 μM with high sensitivity and low detection limit of 3.0563 μA μM⁻¹ and 0.002 μM (S/N = 3), respectively. Besides, the Bi₂WO₆ modified electrodes demonstrate superior electrochemical performances towards the detection of Sudan I than the previously reported articles. Finally, the as-fabricated sensor has been applied to the real-time application for sensitive determination of Sudan I in food samples, such as apple juice and chili powder with acceptable recoveries.

Keywords: Bi₂WO₆, Sudan I, food coloring agent, electrochemical sensor.

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