Highly Sensitive Determination of Caffeic Acid Using a Multi-walled Carbon Nanotubes Modified Electrode with N-Butylpyridinium Hexafluorophosphate Ionic Liquid and Chitosan as Binders

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Multi-walled carbon nanotubes-N-Butylpyridinium hexafluorophosphate ionic liquid-chitosan composite film modified glassy carbon electrode (MWNTs-[BuPy]PF₆-CS/GCE) was prepared and it was applied to the quantitative analysis of caffeic acid. A pair of redox peak with a well-defined electrochemical response signal of caffeic acid was obtained by using cyclic voltammetry (CV) in 0.04 mol·L⁻¹ BR buffer solution (pH 4.0). A novel electrochemical method to determine the caffeic acid with differential pulse voltammetry (DPV) was developed based on the MWNTs-[BuPy]PF₆-CS/GCE. The DPV oxidation peak current showed a good linear relationship with the concentration of caffeic acid in the range from 2.5×10⁻⁸ to 7.0×10⁻⁶ mol·L⁻¹ and the detection limit can reach 5.7×10⁻⁹ mol·L⁻¹. The proposed method can be used for the determination of caffeic acid with the recovery of 96.9-102.8% and the RSD of 2.2-3.1% in real sample.

Keywords: Caffeic acid; Multi-walled carbon nanotubes; Ionic liquid; N-Butylpyridinium hexafluorophosphate; Chitosan.

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