Sensitive Electrochemical Determination of Adenosine-5'-triphosphate with 1-Butyl-2,3-dimethylimidazolium Hexafluorophosphate Based Carbon Paste Electrode

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A new voltammetric procedure was established for the analysis of adenosine-5'-triphosphate (ATP) with ionic liquid 1-butyl-2,3-dimethylimidazolium hexafluorophosphate (BMMImPF₆) based carbon paste electrode (CPE). The modification of high conductive BMMImPF₆ in CPE decreased the interfacial resistance and provided good electrocatalytic activity to accelerate the oxidation of ATP with the increment of the oxidation peak current. A well-defined irreversible oxidation peak of ATP was observed at 1.42 V in a pH 3.0 Britton-Robinson (B-R) buffer solution with an adsorption-controlled process, which was due to the interaction of ATP with the imidazolium group of ionic liquid used. The experimental conditions were optimized with the accumulation time of 80 s and the accumulation potential of 0.3 V. Under the optimum conditions with differential pulse voltammetry, the oxidation peak current showed a good linear relationship with ATP concentration from 0.3 to 700.0 μmol/L with the detection limit as 0.912 nmol/L (3 S/N). This method was not disturbed by the interferences from commonly coexisting compounds, which was applied to detect the drug samples with good recovery.

Keywords: Carbon paste electrode; Adenosine-5'-triphosphate; Voltammetry; 1-butyl-2,3-dimethylimidazolium hexafluorophosphate

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