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Electrocatalytic reduction of nitrite and bromate and their highly sensitive determination on carbon paste electrode modified with new copper Schiff base complex

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Abstract

A modified carbon paste electrode by Cu^{II}-(N,N'-bis(2,5-dihydroxybenzylidene)-1,2-diaminoethane) (Cu^{II}-DHB) as a new synthesized copper Schiff base complex. This modified electrode (ME) was constructed for the simultaneous determination of nitrite and bromate using amperometry and differential pulse voltammetry (DPV). The electrochemical characterization and electro-catalyst of NO_2^- and BrO_3^- were thoroughly investigated by cyclic voltammetry (CV). The treatment of the voltammetric results showed that it was a purely diffusion-controlled process involving one-electron in the rate-determining step. The mechanism for the interaction of nitrite with [Cu^{II}-DHB] Schiff base complex involving the (Cu^{II}/Cu^{I}) redox system. This new ME showed a good and efficient electro-catalytic activity towards the cathodic reduction of nitrite and bromate. The resulting DPV response indicates that [Cu^{II}-DHB]-CPE can be advantageously used to determine nitrite concentration in a linear range of 2-14 nM (R^2 = 0.992) with a detection limit of 1.5 nM. The amperometric result reveals that [Cu^{II}-DHB]-CPE is also an effective material for bromate detection with a detection limit of 10 nM.

Keywords: *Carbon paste electrode, Copper Schiff base complex, DPV, Amperometry, Nitrite, Bromate.*