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Electrocatalytic Oxidation of Hydroxylamine at a Quinizarine Modified Glassy Carbon Electrode: Application to Differential Pulse Voltammetry Detection of Hydroxylamine

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Abstract: The electrocatalytic behavior of hydroxylamine was studied on a glassy carbon electrode modified by electrodeposition of quinizarine, using cyclic voltammetry, chronoamperometry, and rotating disk voltammetry as diagnostic techniques. Cyclic voltammetry showed that the catalytic current of the system depends on the concentration of hydroxylamine. The magnitude of the peak current for quinizarine increased sharply in the presence of hydroxylamine and proportional to hydroxylamine concentration. The diffusion coefficient of hydroxylamine and the catalytic rate constant for the catalytic reaction of quinizarine with hydroxylamine were also estimated using a rotating disk electrode experiment. The kinetics parameters of this process were calculated, and the apparent electron transfer rate constant k_s and α (charge transfer coefficient between glassy carbon electrode and quinizarine) were 4.44 s^{-1} and 0.66, respectively. Chronoamperometry and cyclic voltammetry studies were also used to determine the overall number of electrons involved in the catalytic oxidation of hydroxylamine, which was found to be 1. Hydroxylamine in the range of 1-10 μ M could be determined by differential pulse voltammetry.

Key Words: Electrocatalytic oxidation; hydroxylamine; chemically modified electrode; quinizarine

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