ELECTROCHEMICAL DETERMINATION OF COENZYME Q₁₀ AT A GLASSY CARBON ELECTRODE

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Coenzyme Q₁₀ (CoQ₁₀) is a vitamin-like soluble antioxidant found in the highest concentration in vital organ such as the heart and pancreas. CoQ₁₀ has been shown to be beneficial in disease conditions ranging from Parkinson’s disease to cataracts, in addition to heart disease. Furthermore, it is now believed that CoQ₁₀ is the key nutrient for generating 95 percent of the total energy required by the human body.

Quinones show a characteristic reduction and oxidation (redox) chemistry, and the biological importance of quinines centers on the resulting electron and proton transfer functions of these compounds. Oxidation (or reduction) of quinol (or donated to the quinine) to form a relatively stable radical, called a semiquinone, which is resonance-stabilized. A second hydrogen ion can be removed (or added) to complete the oxidation (or reduction) to a quinine (or quinol). The transfer of electrons during oxidation and reduction of quinines can be used to quantity them, using electrochemical detection.

Voltammetric experiment was carried out with a three-electrode cell in which the glassy carbon electrode of 1 mm in diameter and silver chloride electrode were used as a working and a counter electrode, respectively. All potential were measured and reported against the external silver chloride reference electrode with 1M NaCl solution. Standard solution for electrochemical experiments was prepared by dissolving a suitable amount of CoQ₁₀ in an ethanol solution followed by heating to a temperature not more than 35 Celsius degrees. The stock solution was stored in the dark and cool. Background solution was prepared by dissolving standard power of Na₂HPO₄ in 1 L volumetric flask.

All voltammetric experiments were performed using an electrochemical analyzer “TA-2” (“Tomanalyt” Ltd., Tomsk). We obtained the influence of various conditionals (pH of background solution, scan rate, conditioning time, conditioning potential) as a result a good and stable redox peaks of coenzyme Q₁₀ on a glassy carbon electrode were obtained (figure 1).

CoQ₁₀ is electroactive at glassy carbon electrode and, therefore, a simple, rapid, sensitive, and accurate method for compound analysis was described.

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Figure 1. Cyclic voltammogram (w=30 mV/sec, pH 6.86) without coenzyme Q₁₀ (1) and with 5.5×10⁻⁶ (2), 5.5×10⁻⁵ (3), 5.5×10⁻⁴ (4), 5.5×10⁻³ (5).