PATTERNS OF ELECTROCHEMICAL REDUCTION OF GLUTATHIONE ON A CARBON-CONTAINING ELECTRODE MODIFIED WITH GOLD

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Biologically active sulfur-containing compounds, such as glutathione, containing thiol (SH-) groups play an important role in physiological and biochemical processes in the human and animal organisms [1]. Glutathione (GSH) acts as an antioxidant, prevents the peroxidation of lipids and phospholipids in cells, tissues of humans and animals. Its antioxidant effect is also in the ability to interact with organic free radicals, including oxygen radicals. The most active functional group of the molecule is thiol (sulfhydryl) SH-group, due to which GSH takes an active part in many oxidation-reduction processes in the human body and animals [2].

Therefore, studies on predicting the oxidation-reduction behavior of GSH in model systems are relevant to date. The electrochemical properties of GSH on a carbon-containing electrode modified with gold were investigated. A gold film was applied to a carbon-containing electrode voltammetrically (W = 5 mV/s, in the potential range from -0.1V to +0.05V) from a standard solution of $HAuCl_4$ of 100 mg/l. Prior to the cathodic properties of GSH, oxygen was removed by applying 0.1M sodium sulfite solution. It was noted that when GSH is introduced into the cell (concentration $6.6*10^{-6}$ M), the oxygen reduction current increases at a potential of -0.6V, which increases from the time of the experiment.

It is known that GSH is an antioxidant that binds to oxygen radicals. Thus, when GSH is introduced into a cell, it binds to oxygen radicals according to the mechanism:

$$2RSH + O_2^{-\bullet} \leftrightarrow O_2 + RSSR + 2H^+$$

This leads to the formation of O_2, which is restored at E = -0.6 V on a carbon-containing electrode modified with gold.

This technique of depositing a gold film, as well as thiolating the gold surface of the electrode, is further applicable to the creation of a biosensor.

References:

1. KALAIYARASAN, G., NARENDRA KUMAR A. V., SIVAKUMAR, C., JOSEPH, J. 2015. *Electrochem. Commun*., **56**, pp. 29-33.
2. HARFIELD, C., BATCHELOR-MCAULEY, C., COMPTON, R.G. 2012. *Analyst.*, **137**, pp. 2285–2296.