Surfactant modified carbon based platform for imunosensor development

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Surfactants can be used in the construction of voltammetric sensors to improve and enhance the function of the electrode in terms of selectivity, sensitivity, improving electron transfer, [1] etc. In particular, the formation of molecular films on the electrode surface with a specific orientation enable the immobilization of other compounds by expanding the use of surfactants in the field of electrochemical sensor [2]. A new voltammetric immunosensor has been studied for the determination of ferritin based on the principles of biological cognition, antibody-antigen response combined with nanotechnology, and the advantages of electrochemical detection strategies. A thin layer of trimethyl-tetradecylammonium ion (TTDA) is used on the electrode surface (GCE / CPE) to better immobilize ferritin antibodies (FeAb). The surfactant forms a dense layer with a positive charge on the solution, which enables the fixation of the carboxyl groups of the antibody providing a stronger and more stable bond between FeAb and the electrode surface. The electrodes were characterized by cyclic voltammetry (CV) and differential pulse voltammetry (DPV). Experimental conditions such as surfactant amount, pH, scan rate, immobilization time, support electrolytes are studied and optimized to obtain better analytical performance parameters. The immunosensor is calibrated by calculating the current reduction and expressing it as a function of the corresponding ferritin concentration [3]. The dependence is observed to be linear up to the concentration of 0.6 mg / L ferritin (R^2 = 0.9992), and the sensitivity more than 2 times higher than the bare GCE. Quantitative analysis of RC% = f ($C_{ferritin}$) in equilibrium measurements was used to calculate the binding/affinity constant of the immunological reaction, respectively. The double reciprocal coordinates was used for data linearization [4] and the binding constant resulted in the order of 10^9, indicating a specific reaction. The analytical application of the modified immunosensor was studied in relation to the determination of ferritin in the spiked human serum sample. Recovery of ferritin addition resulted within 87% to 125% for immunosensors constructed into the GCE / CPE surfactant-modified platform.

References

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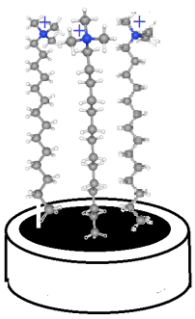

Figure 1 Schematic dense layer with positive charge onto GCE surface

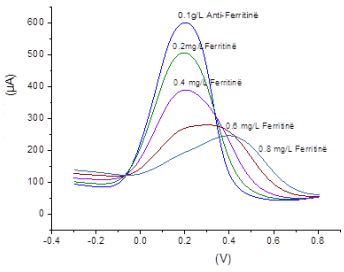

Figure 2 Typical DPV signal of imunosensor in different concentration of ferritin