

Development of electrochemical immunosensors based on CPE modification

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Ferritin is a major intracellular iron storage protein present in all cells, tissues and tissue fluids of the organism. Low ferritin levels result in lower iron concentrations which is directly involved with anemia. Elevated levels of ferritin, or hyperferritinemia, indicate the presence of viruses and bacteria into the body. Clinical observations on Covid-19 patients have reported cases accompanied by elevated levels of ferritin in blood [1]. An attempt is made to develop a new voltametric immunosensor for determination of ferritin based on the principles of biological recognition, antibody-antigen reaction combined with nanotechnology and the advantages of electrochemical detection strategies. Carbon Paste Electrode modified with grain natural material, characterized as titanium magnetite is used as substrate for immunosensor. The immobilization of ferritin antibody (FeAb) can be effectively improved by using a thin film of surfactant [2], trimethyl-tetradecylammonium chloride (TTDC), onto the CPE substrate. The modification procedure of the immunosensor is characterized by cyclic voltammetry (CV) and differential pulse voltammetry (DPV). The effect of FeAb incubation time and the FeAb-ferritin reaction kinetic are explored to provide optimum analytical performance. The quantitative determination of ferritin is based on the change in DPV response before and after antibody-antigen reaction [3]. The linear range resulted within the interval 0.05 – 0.5 mg/l ferritin ($R^2=0.9947$). The recovery of ferritin addition in real sample matrix resulted from 87% to 125%. The specificity of FeAb-ferritin reaction evaluated in terms of binding constant, resulted in the order of 10^{-9} l/mol. All measurements are done in pH=7 phosphate buffer saline (PBS) at room temperature.

References

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Figures

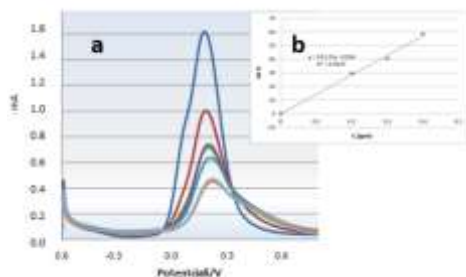


Figure 1. (a) DPVs of FeAb/CPE in different concentrations (0.1-0.5mg/L) of ferritin solutions in PBS; (b) calibration graph.