CHARACTERIZATION OF L-TRYPTOPHAN IMPRINTED POLYPYRROLE DEPOSITED ON THE GRAPHITE ELECTRODE

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Tryptophan is an essential constituent of the diet. It plays an important role in protein synthesis, and is also the precursor of a variety of biologically active compounds including serotonin, melatonin, tryptamine, quinolinic acid and kynurenic acid. In addition, tryptophan is a precursor to the coenzymes NAD and NADP, and can replace niacin as an essential nutrient. Both excessive intake and deficiency of tryptophan are detrimental to health. Tryptophan and its metabolite niacin deficiency can cause lethargy, loss of hair, skin lesions and pellagra. Small doses of tryptophan are often used in the treatment of mild insomnia. However, large amounts of tryptophan can exhibit tremor, rigidity, hyperreactivity, myoclonus and even generalized seizures [1]. Therefore it is useful to monitor tryptophan levels in the body.

Quantitative tryptophan amino acid analysis can be carried out by high-performance liquid chromatography (HPLC) [2]. However, this method is impractical in sensor application, thus more practical and easy to produce electrochemical sensors are gaining popularity.

In this research electrochemical sensor based on molecularly imprinted polymers was used to determine L-tryptophan. Molecular imprinting allows the preparation of synthetic polymers featuring receptor or catalytically active sites. The most common form of imprinting comprises the synthesis of polymers in the presence of templates. Removal of the template from the formed polymer liberates binding sites complementary in shape and binding groups to the template structure. The resulting polymers are then used in various recognition-based applications [3].

Cyclic voltammetry was applied for electrochemical polymerization of molecularly imprinted polypyrrole (MIP) with L-tryptophan template molecules. The electrochemical synthesis was performed by potential cycling (10 potential cycles) based method, the potential was cycled in the range of 0 V – 1.0 V *vs* Ag/AgCl (3 M KCl), scan rate 50 mV/s and step potential 2.44 mV.

After the synthesis MIP‘s template molecules were removed by washing MIP in stirred water. The sensing ability of L-tryptophan was evaluated in a solution of Britton-Robinson buffer (BRB) with pH value of 2.50. Differential pulse voltammetry (DPV) method was chosen to determine L-tryptophan concentration in a BRB solution. Measurement parameters were as follows: step potential 5 mV, modulation amplitude 25 mV, modulation time 50 ms and interval time 500 ms, in the potential range of 0.4 V - 1.2 V *vs* Ag/AgCl (3M KCl). The results show that L-tryptophan eletrochemical oxidation peaks were observed at potential around 0.9 V *vs* Ag/AgCl (3 M KCl).

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