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IMPEDANCEMETRIC SENSOR BASED ON SUPRAMOLECULES OF CYANURIC ACID FOR THE RECOGNITION OF TYROSINE ENANTIOMERS

Impedance spectroscopy is an effective method for characterizing the electrode surface, which is used to study the phenomenon on the phase interface electrode-solution. The advantage of this method lies in the fact that it provides greater accuracy for a wide range of frequencies of the acting signal and experimental efficiency (the amount of received information is very high than the cost of the experiment).

The Nyquist diagram is used to graphically represent the impedance. The Nyquist diagram is a complex ohmic plane, where the real component Z' is measured the X-direction, and the imaginary component of the resistance Z" is measured the Y-direction. It is necessary to calculate the values of Z' and Z" from the data array for constructing of the impedance spectrum in Nyquist coordinates and getting each point of the curve.

In this work, the electrical conductivity of the modified by self-assembled supramolecules of cyanuric acid (CA) graphitized carbon black paste electrode (GPE) was studied on the model solutions of tyrosine (Tyr) enantiomers.

The enantiomers of tyrosine in the Britton-Robinson buffer solution of pH 2.10 on the GPE modified by CA were irreversibly oxidised at a sweep rate of 100 mVs^{-1} with the formation of the corresponding peaks in the investigated potential range. The cyclic voltammetry and electrochemical impedance spectroscopy (Fig. 1) results indicate that the GPE modified by CA afforded more specific interaction with D-Tyr caused by the different steric hindrances between the Tyr enantiomers and the nanocavities of the CA supramolecules. The supramolecules of CA acted as a selector for Tyr enantiomers, which affected the potential shift and currents.

From the Nyquist diagram (Fig.1b), it can be seen that the spectra were well described by an equivalent electric circuit, where R_{et} showed the resistance to the electron transfer at the electrode-solution interface and it was shown in the graph as a semicircle of the impedance spectrum. The impedance spectrum showed that the graphitized carbon black paste electrode modified by self-assembled supramolecules of cyanuric acid had the highest resistance relatively bare electrode.

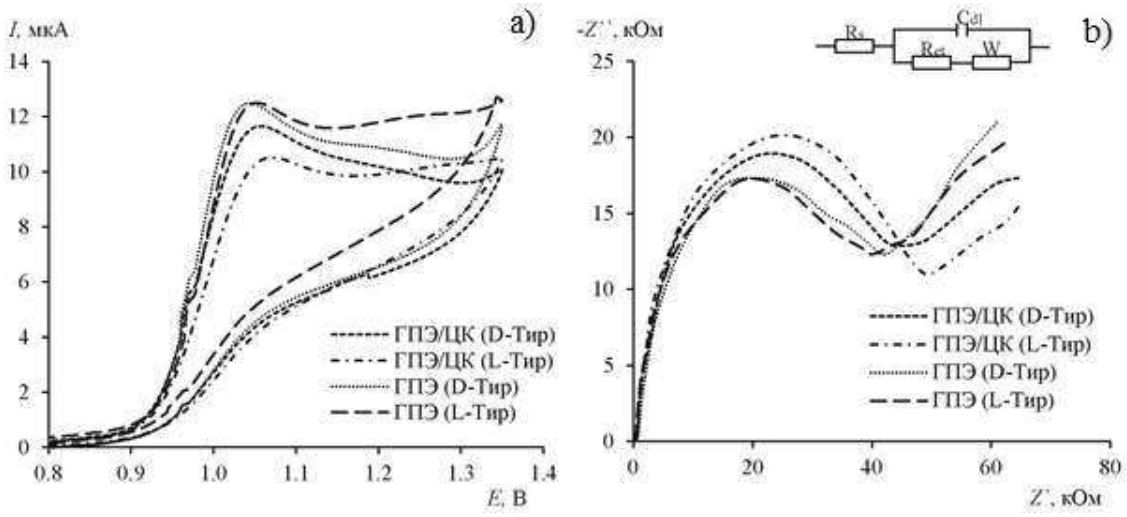

Fig. 1. (a) Cyclic voltammetries of 1.0 mM solutions of D- and L-Tyr enantiomers in Britton-Robinson buffer solution of pH 2.10 on bare GPE and GPE modified by cyanuric acidat 100 mVs^{-1}. (b) Nyquist plots and equivalent circuit in 1.0 mM solutions of D- and L-Tyr enantiomers. Inset: the equivalent circuit used to model impedance data.

Thus the electrical conductivity of graphitized carbon black paste electrode modified by self-assembled supramolecules of cyanuric acid was studied using electrochemical impedance spectroscopy. The disadvantage of an electrode modifier is an increase in resistance, and advantage it allows the determination of tyrosine enantiomers.

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SORPTION AND PHOTOCATALYTIC TIO_2 PROPERTIES

Titanium (IV) oxide (TiO_2) has been widely studied as a unique material that can be effectively used in heterogeneous photocatalysis to remove organic contaminants from water [1,2]. As sorption is one of the important stages of the photocatalytic process it is crucial to investigate sorption properties of materials and develop synthesis methods that allow obtaining of catalysts with required properties.