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COMPOSITE VOLTAMMETRIC SENSORS BASED ON COMPLEX COMPOUNDS OF TRANSITION METALS FOR RECOGNITION AND DETERMINATION OF PROPRANOLOL ENANTIOMERS

In many pharmaceutical preparations, the active substance is an optically active compound, and therefore there is a need for enantiomeric analysis at all stages of the development and use of such preparations. Usually, various electrochemical methods are used for these purposes (NMR spectroscopy, capillary electrophoresis, chromatography, etc.). However, most of the methods do not have sufficient rapidity, so in recent years there has been a constantly growing interest in the development of new methods of enantiomeric analysis, which include methods based on enantioselective voltammetric sensors (EVS) [1-5]. At the moment, EVS based on complex compounds of transition metals with organic chiral ligands are of the greatest interest, which are characterized by simple manufacture, availability, and relative cheapness.

To develop composite voltammetric sensors based on a glassy carbon electrode (GCE), a polyelectrolyte complex of chitosan and N-succinylchitosan (PEC) and mixed chelate complexes $[M(S\text{-Ala})_2(H_2O)_n]$–$[M(S\text{-Phe})_2(H_2O)_n]$ (M = Cu(II), Zn(II); n = 0–1)) as chiral selectors. Enantiomers of propranolol (Prp) acted as the analyte. According to the obtained differential-pulse voltammograms, it was concluded that the difference in analytical signals on GCE and GCE/PEC is insignificant. The greatest differences between the analytical signals of Prp enantiomers were observed on GCE/PEC–$[Cu(S\text{-Ala})_2]$–$[Cu(S\text{-Phe})_2]$ (1) (i_{pS}/i_{pR} = 1.37 and ΔE = 20 mV) and

GCE/PEC–[Zn(*S*-Ala)$_2$(H_2O)]–[Zn(*S*-Phe)$_2$(H_2O)] (2) (i_{pS}/i_{pR} = 1.12 and ΔE = 20 mV). The linear nature of the dependence of the current of the Prp oxidation peak on its content in solution remains in the concentration range from 2.5×10^{-5} to 1.0×10^{-3} Mol L^{-1} with limit of detection (LOD) (3 s/m) of 1.24 μM and 0.90 μM and limit of quantification (LOQ) (10 s/m) 4.15 μM and 3.02 μM for R- and S-Prp respectively on the sensor (1). For sensor (2), the linear dependence remains in the range from 5.0×10^{-5} to 1.0×10^{-3} Mol L^{-1}, LOD and LOQ are 0.87 μM and 2.91 μM for R-Prp, 0.78 μM and 2.62 μM for S-Prp respectively. The correctness of determination of Prp enantiomers in model solutions was assessed by the “added–found” method. To evaluate the analytical capabilities, the sensors were tested for the determination of Prp enantiomers in biological fluids. Statistical evaluation of the results using the "added–found" method indicates the absence of a significant systematic error.

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