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DEVELOPMENT OF SCREEN-PRINTED CARBON ELECTRODES FOR LOW-COST TEST DIAGNOSTIC SYSTEMS

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In this paper, the properties of printed electrodes depending on the ink composition were studied. Such binding polymers as acetylcellulose and polyacrylate, graphite of different morphologies and particle sizes were considered, after which the composition of carbon ink with the lowest charge transfer resistance was determined. The characteristics of cyclic voltammograms of different compositions were compared with each other and with commercial electrodes.

Currently, in connection with the coronavirus, the issue of diagnosing diseases has become particularly relevant. More and more people are at risk because of unreliable diagnostics. Moreover, the situation becomes uncontrollable, as a result of which the economy and education suffer. If we offer a universal test system for detecting coronavirus, we will improve our country's situation. In some foreign countries, the test analysis for coronavirus is free. That is, anyone can make a test and get the result, and as a result, take the necessary measures.

We plan to create a new test system with screen-printed carbon electrodes. Carbon materials are characterized by relative cheapness and high conductivity. The measurements were carried out by cyclic voltammetry at different scanning rates (0.05 V/s; 0.01 V/s; 0.005 V/s). The clearest peaks were obtained at low rates. We tried to add graphite of various purity, carbon black, and carbon nanotubes (CNTs) to the carbon ink. We also tried to vary their ratio. As a result, acetylcellulose was chosen as the binding polymer, and graphite A8, A10, and A11 were chosen as carbon materials since they have a high degree of ordering in all samples. Graphite A10 has the most ordered structure. Graphite grades A8 and A11 have a similar degree of ordering. CNTs were used as microparticles for doping. The measurement results were compared with those of commercial electrodes.

We have obtained inks with optimal characteristics to produce reproducible screen-printed electrodes without special equipment requirements. A party to the electrodes in the amount of 1000 pieces was made. This test system is characterized by a lower cost and the ability to perform mass analysis. In addition to the coronavirus, our universal electrochemical platform is suitable for encephalitis detection, staphylococcus and various types of hepatitis virus.

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