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# DEVELOPMENT OF A MINIATURE FLEXIBLE SENSOR SYSTEM FOR DETERMINING THE CONTENT OF SODIUM AND POTASSIUM IN MODEL SOLUTIONS

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The report discusses a method for creating a miniature sensor system based on a conductive carbon fiber to determine the content of potassium and sodium ions in model solutions. All solid-state silver chloride electrode on a carbon fiber is used as a reference electrode

The problem of personalized diagnostics is relevant all over the world, including Russia. The presence of endemic regions and poor living conditions suggest an increase in the incidence of diseases and make us look for new approaches to the diagnosis, treatment and prevention of various diseases. Accurate and timely risk assessment requires constant monitoring of physical and chemical parameters of the human`s health state. On the other hand, it should be a useful tool to athletic performance increasing.

The purpose of this work is to create a miniature flexible sensor system for determining the content of sodium and potassium in model solutions.

The basis for creating sensors was ion-selective electrodes based on conductive carbon fiber and a hydrophobic membrane on polyvinyl chloride using selective components-ionophores (Sodium Ionophore X-4-*tert*-Butylcalix[4]arene-tetraacetic acid tetraethyl ester for $Na^+$ and Potassium Ionophore I Valinomycin for $K^+$). An all-solid-state silver chloride electrode made of carbon fiber was used as the reference electrode, using polyelectrolyte multi-layers as a pseudo-liquid inner layer, which ensures the stability of the measured signal relative to existing commercial sensors. The possibility of creating this type of electrode using cheap materials to provide contact (carbon fiber) and the presence of a pseudo-liquid connection will significantly miniaturize the sensor system relative to existing macroelectrodes.

To establish the efficiency of the electrodes, the open-circuit potentiometry method was used. Potentiometry is a non-destructive technique. The functioning of electrodes was demonstrated by measuring the calibration curves with one set of electrodes and changing the concentration of $Na^+$ and $K^+$ in the test solution. The results obtained show a linear response in the range from $10^{-4}$M÷1M. The response of $Na^+$ (slope: 51,35±5,4mV per decade) and $K^+$ (slope: 40,0±1,0 mV).

During the experiments, the composition of selective electrode membranes and the reference electrode was determined, and a method for their manufacture was developed. Thus, a big step was taken towards creating an ensemble of selective electrodes for determining the main biomarkers in the human body.