Nanocomposites and nanomaterials

Electrochemical properties of nanoporous carbon material in aqueous electrolytes

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The work is devoted to the study of the behavior of electrochemical capacitors (EC) in K^+ - containing solvents. Nanoporous carbon (NC) was used as the electrode material. It was obtained by carbonization of plant raw material. Optimization of the pore size distribution was carried out with chemical-thermal method using potassium hydroxide as an activator. For this purpose the dried apricot seeds were milled to a fraction with size of 0.25-1 mm and carbonated at 250-350 ºC, after mixed with potassium hydroxide and water in the weight ratio 1:1. The resulting mixture was thoroughly stirred for 1-2 hours and dried in an incubator at 90ºC up to constant weight. The dried material was placed in a furnace and heated in an argon atmosphere at 850-920ºC at the heating rate of 10ºC/min for 20 min. After cooling, the resulting material was washed up to neutral pH and dried at 90ºC up to constant weight. EC electrodes were formed by pressing of NC and conductive additive in the form of lamel on the nickel grid. Formed electrodes were placed in two-electrode cell with type size "2525", which after the pouring with the electrolyte was sealed. We used 10% salt aqueous solution of K_2SO_4, 15 % KNO_3, 20 % KCl, 25 % KOH and 40 % KI as an electrolyte.

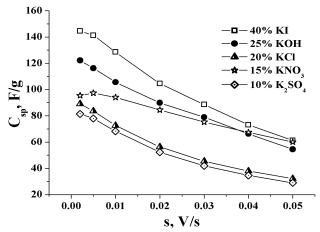

Fig. 1. The dependence of specific capacity of the NC from scan rate

Parameters of EC were studied on a set AUTOLAB PGSTAT 12. The analysis of capacity behavior of the NC in these electrolytes was conducted based on the obtained voltampergramms. Dependence of specific capacity of the NC from scan rate accordingly to the voltampergramms data is presented on the Fig.1. It is shown

that the NC has high values of capacity, which is realized by charge accumulation on the electrical double layer and through pseudo accumulation of ions on the surface of the material. It was established that the EC based on NC is stable over the entire range current densities, and the capacity of the material essentially depends on the optimal choice of the electrolyte.