JOINT CONFERENCES
ON ADVANCED MATERIALS AND TECHNOLOGIES

The 14th Workshop
on Functional and Nanostructured Materials

FNMA'17

The 7th International Conference
on Physics of Disordered Systems

PDS'17

25–29 September 2017
Lviv & Yaremche, Ukraine

ABSTRACT BOOK

ABS62

Nanoporous Carbon as Electrode Material for Electrochemical Capacitors

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The problem of the porous structure formation in nanoporous carbonaceous materials (NCM) which are the basis of electrodes of electrochemical capacitors (EC) is still relevant both in scientific and in applied terms. NCM are not only the basis of classical EC, which operates on the principle of charge/discharge of the double electric layer, but they are also practically an integral part of devices of hybrid and pseudocapacitors. The porous structure, formed in the NCM in different ways, determines the possibilities of their application in charge accumulation devices. In particular, the pore size distribution and the surface area are the most important characteristics, without which it is impossible to select one or another electrolyte and to establish the optimal ratio between the internal resistance and the specific capacity of EC [1].

The results of electrochemical studies of NCM as the electrode material for EC have been shown in the work. The NCM were obtained from raw materials of plant origin by carbonization and activation with sodium hydroxide. Carbonated material was activated by sodium hydroxide at a temperature of 600, 700, 800 and 900°C. Carbon was mixed with NaOH and water in the ratio 1:1:1. After activation the material was washed off by hydrochloric acid and hot distilled water to neutral pH.

EC electrodes were formed by pressing the NCM and a conductive additive in the form of lamella on a nickel grid. The formed electrodes were placed in a two-electrode cell with typical size “2525”, which was sealed after having been poured with 3 M aqueous KOH as the electrolyte.

The specific capacity characteristics of the obtained EC were studied by galvanostatic cycling at a discharge current of 10–100 mA. The dependence of EC specific capacitance on the thermochemical activation temperature was established on the basis of the analysis of galvanostatic research. It was shown that the NCM activated at 600°C was characterized by a specific capacity of 138 F/g. The activation at 700–800°C allows us to obtain NCM with a capacity of 90–95 F/g. The smallest capacity of 62 F/g is defined for the material activated at 900°C. The capacity value is determined at a discharge current of 50 mA.

An optimal activation temperature (600°C) of the carbon material by sodium hydroxide is established for obtaining NCM with a specific capacity of 140–130 F/g in the range of discharge currents of 10–200 mA.

References

[1] Rachiy B, Budzulyak I, Vashchynsky V, Ivanichok N, Nykoliuk M 2016 *Nanoscale Research Letters* **11** 18