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The PRES conferences started in Prague in 1998, and since then they have been held in Budapest, Hungary (1999), Prague (2000), Florence, Italy (2001), Prague (2002), Hamilton, Canada (2003), Prague (2004), Taormina, Italy (2005), Prague (2006), Ischia, Italy (2007), Prague (2008), Rome, Italy (2009), Prague (2010), and Florence, Italy (2011).

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Symposium on porous materials, nanostructures and nanocomposites

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New carbon-containing materials such as electrodes for electrochemical processes

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The composite electrodes have advantages against the electrode composed of one conductive phase. And that's why they are widely used and their manufacturing methods are intensively developing. The advantages of composite electrodes are: lower cost, lower weight, varieties of shapes and designs of the electrodes, higher signal / noise ratio, the possibility of volume or surface modification as the conductive and insulating phases. The volume and surface modification opens the great perspectives for creating electrodes with the given electrochemical properties, including microelectrode ensembles [1].

Apricot pits, walnut shells which are plant raw materials and shungite concentrate which is carbon-mineral raw material from "Bakyrchik" deposit of East Kazakhstan were used as a material to obtain carbon-containing electrodes.

The flotation process was carried out to stabilize the structure of shungite materials. The concentrate with carbon content 40 ± 2% by weight was obtained [2].

The thermic carbonization at the temperature 800 ° C (in an inert atmosphere of argon) and activation with superheated steam at the temperature of 850-950 ° C were carried out to increase the specific surface area and mechanical strength of the materials. Increasing the specific surface area happens because of the burnout of unstructured carbon, organic compounds and the opening of "blocked" pores. The studied materials were obtained with the following parameters:

- the sample based on shungite concentrate - specific surface area is 153.36 m^2/g; mechanical strength is 53%;
- the sample based on apricot pits - specific surface area is 505.68 m^2/g; mechanical strength is 91%;
- the sample based on walnut shell - specific surface area is 423.45 m^2/g; mechanical strength is 86%.

The electrodes were obtained based on the given materials. The electrodes were obtained by the method of spreading paste from the test material and PVDF (Polyvinylidene fluoride) on copper carrying base.

The intercalation capacity is the most important characteristic of the electrodes. The intercalation capacity is quantity of electricity that is generated at the electrode when full charged, per unit mass.

The results were obtained on Neware battery testing systems. The results showed that the average value of the discharge and charge capacities of samples based on carbonizate of walnut shell exceed significantly the capacity of samples based on shungite concentrate (Q charge - 31.4 mA · h/g; Q discharge - 2.1 mA · h/g) and carbonizate apricot pits (Q charge - 6.5 mA · h/g; Q discharge - 0.3 mA · h/g). It may be connected with the structure of walnut shell. The initial charge and discharge capacities of this sample are equal to 566.0 mA · h/g and 18.9 mA · h/g respectively.

The given results let us to make a conclusion that the samples based on carbonizate of walnut shell can be used as the main material in the further experiments for sorption of metals (Au^+, Ag^+, Ca^{2+}, Mg^{2+}, etc.).

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