Electrochemical Supercapacitor Based on Carbon Onions

E.G. Bushueva, A.V. Okotrub, P.S. Galkin, S.P Moseenkov*, and V.L. Kuznetsov*

Nikolaev Institute of Inorganic Chemistry SB RAS, pr. Ak. Lavrentieva 3, Novosibirsk 630090, Russia

**Boreskov Institute of Ñatalysis SB RAS, pr. Ak. Lavrentieva 5, Novosibirsk 630090, Russia*

New carbon nanomaterials can be used as electrodes for supercapacitors. Their specific capacity depends on surface morphology of an electrode, preliminary processing, and wettability of the electrode surface by various electrolytes. The purpose of the present work is researching of electrochemical properties of new carbon nanomaterials produced from annealed nanodiamonds.

The researching materials were carbon onions, graphite and fullerene soot. The carbon onions were obtained by annealing of nanodiamonds at temperature 1600K, 1800K, 1900K, and 2000Ê. Natural graphite has been purified by a special technique. The purity of graphite was 99,96%. The fullerene soot presented a product of arc discharge graphite evaporation and contained of about 2% of fullerenes.

The electrochemical experiments were carried out at ambient conditions. Cyclic voltammograms were recorded by PI 50-1 potentiostate within the potential range from 0 to 1 V. Scan rates of potential were 20, 50, and 100 mV/s. The electrolytes used were 1Ì H_2SO_4 or 5Ì KOH. The visible surface of an electrode was 1cm^2.

We found that graphite has the lowest specific capacity with alkaline electrolyte using (~0.1 F/g), while the highest specific capacity (~21 F/g) corresponds to the carbon onion produced with nanodiamond annealing at 1800K. With acid electrolyte using, graphite has the lowest specific capacity (~0,03 F/g) and the highest specific capacity corresponds to carbon nanodiamonds (~44 F/g), which were annealed at 1800K. We monitored monotonic dependence of carbon nanomaterials specific capacity on the specific surface. It was shown that cyclic voltammogram shape can be changed with electrolyte kind, while the integrated capacity was constant.