Physico-chemical nanomaterials science

Influence of microwave irradiation on high-rate properties of graphite from Zavalie deposit

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The range of applying carbon materials is very wide. Thanks to such properties as high electronic conductivity, chemical passivity and a layered structure, graphitized carbon materials have found their application as electrodes in secondary lithium ion batteries. In such electrodes, carbon materials perform several functions combining the role of the electronic and ionic conductor with necessary porosity. At present, a large number of various methods exist for increasing porosity of the electrodes. Heating particles of oxidized graphite due to ohmic heat release during its interaction with a high-frequency electromagnetic field is one of them.

Zavalie natural graphite (grade GAK-1) has been used as a starting material. For the purpose of further purification, this material after grinding has been subjected to a treatment in a mixture of acids [1]. Subsequent heating of thus oxidized graphite with citric acid has been carried out by a microwave irradiation, where the maximum output power was 700 W. Increasing the volume of the carbon material has been observed during the microwave exposure accompanied by intense luminescence. Temperature measured at the time of the microwave oven shutdown, was 920 ± 10 °C.

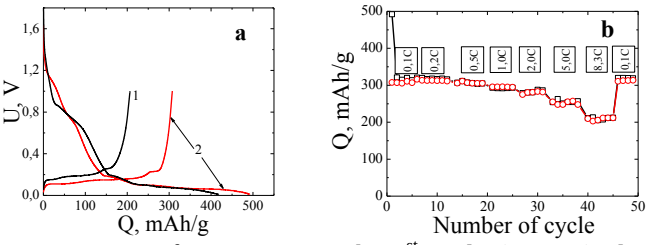

Fig. 1. Charge/discharge curves on the 1st cycle before (1) and after (2) treatment (a) and the dependence of specific capacity on current loads upon cycling (b).

Increase in specific capacity on the 1st cycle (Fig. 1a) clearly shows additional purification of the starting material. Electrochemical characteristics of the sample (Fig. 1b) reveal that the specific capacity values are of 200 mAh/g at the current loads of above 8C. It can be attributed to the formation of amorphous carbon on the surface of crystalline graphite during its pyrolysis in the presence of citric acid.

[1]. Barsukov V. Z., et al.; Russ. J. Electrochem., **2008**, 44 (5), 579-584.