

Physico-chemical nanomaterials science

Electrochemical properties of two types of graphite for using as anode material for lithium-ion batteries

V.V. Mukhin¹, M.M. Suslov¹, A.V. Potapenko², Anna V. Potapenko²

¹*Kyiv National University of Technologies and Design, Kiev,
2 Nemirovich-Danchenko Str., Kyiv 01011, Ukraine*

²*Joint Department of Electrochemical Energy Systems, Kiev, 38a Vernadsky Blvd.,
Kiev 03680, avoloshka@ukr.net*

High demand in lithium ion batteries (LIBs) is significantly determined by rapid development of portable electronics, and the need in devices of very high specific characteristics is permanently growing. Lithium alloy materials, oxide materials and graphites [1] are studied as anode materials for LIBs. Unlike Li metal, graphites do not form dendrites, which cause a decrease in cycleability of electrode materials and their subsequent degradation. For high rate application, graphites must meet certain requirements, viz., (i) high specific capacity; (ii) minimal irreversible capacity at the intercalation of lithium ions on the first cycle; (iii) high coulombic efficiency.

The aim of this work is a comparison of a natural graphite of a Ukrainian producer ("Zavallivsky Graphite" company) and a commercial material (SLC 1520, USA) for electrochemical applications. According to many authors, a general method of preparing electrode-grade graphite is its treatment in acids, which improves electrochemical characteristics of this material, such as specific capacity.

Electrochemical measurements were performed on a home-made potentiostat in model CR2016 coin cells against lithium metal. The composition of electrode was 82% of active material, 10% of carbon black, and 8% of PVDF. LiClO₄ in mixture of ethylene carbonate and dimethylcarbonate and Celgard 2500 were applied as an electrolyte and separator membrane. Initial discharge capacities of the natural graphite and commercial material have been compared, and the influence of acid pre-treatment of the natural graphite on its discharge capacity has been determined.

[1]. Wang J.; Verbrugge M. W.; Liu P.; J. Electrochem. Soc., **2010**, 157 (2), A185-A189.