Development of double-layer anode material based on titanium nanotube for lithium batteries

Ablayeva K., Abduakhytova D, Lepikhin M

Al-farabi Kazakh National University, Al-farabi, 71, Almaty Kazakhstan

E-mail: *kamila_ablayeva@mail.ru*

Recently, considerable efforts of specialists in the field of power sources are aimed at research on fully 3D microbatteries. The key advantage of a 3D microbattery is the higher surface area as compared to a planar film that allows for increased contact area with the electrolyte and more surface sites available for reversible reactions with lithium ions. This in turn leads to improved battery kinetics and increased power density while maintaining a small areal footprint. This peculiarity of the battery design can be provided by the use of 3D structured cathode/anode materials, the most attractive of which are highly ordered nanotubes (NTs) made of titanium dioxide with high capacity at fast charge and discharge rates and excellent long-term cycling characteristics. Apart from this crucial result, key to the successful fabrication of a full solid state microbattery is the conformal deposition of electrolyte on the self-supported electrode material to preserve the 3D architecture.

To investigate the effect of the surface conductive layer on electrochemical intercalation in titanium nanotubes, films with predominantly electronic or ionic conductivity were deposited on their surface. The ion-conducting layer was obtained on the surface of titanium nanotubes by electropolymerization and drop cast methods. The SEM images showed that the using of this two method leads to the conformal deposition of the electrolyte into the 3D TiO_2 nanotubes. The positive influence on the efficiency of intercalation of the ionic conductor in the presence of the nanotube surfaces was established.