Structural and electrochemical properties of molybdenum oxide as an active material for second rechargeable batteries

Dae-Yeop Park, Seung-Taek Myung

Department of Nano Technology and Advanced Materials Engineering, Sejong University, Gunja-dong, Gwangjin-gu, Seoul, 143-747, Republic of Korea
Corresponding to smyung@sejong.ac.kr

These days, lithium-ion batteries in portable device and energy storage system are inevitable to improve our daily life. Graphite is commonly used as an anode material due to its good cyclability and electric conductivity. However it has a moderated capacity. To meet increasing demand of lithium ion barriers possessing high capacity, development of the novel materials is very important concern. Among promising active materials such as metal, alloy, oxide, fluorides, and so on, molybdenum oxide is promising electrode material in terms of its high theoretical capacity, low cost, safety, and abundance. However, it has the poor capacity retention because of their conversion reaction accompanying structure change.

In the present study, ammonium heptamolybdate tetrahydrate (AHM : $(NH_4)_6Mo_7O_{24}\cdot 4H_2O$) dissolved in distilled water to form solution A. 5M Nitric acid was prepared, and then it was added to dropwised solution A to form white precipitate, and was transferred to a Teflon-lined stainless-steel autoclave and hydrothermally reacted at various temperatures and times. As synthesized precipitate filtered and washed with distilled water for several times, following by drying 80^oC for overnight. And then, carbon coating are conducted using various carbon sources. As-synthesized powders were characterized by XRD, SEM, XPS, and TEM. Electrochemical properties of synthesized powder were measured by galvanostatic cycle test.

As a result, the synthesized powders have highly crystallinity without other impurities. Belt type morphology was observed with various sizes. Electrochemical performance showed that the synthesized molybdenum oxide delivered a specific capacity of above 600mAh g^{-1} with good capacity retention in operation range of 0.01-2.5V.