Abstract

Local Oxidation-Reduction and Current-Voltage Spectroscopy on V2O5 Cathode of the Li Ion Battery by UHV STM/AFM

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The study of thin film rechargeable Li ion battery with V2O5 cathode was performed to create the power source, which can be integrated with an electronic chip in the future.

In our experiments, the probe of Scanning Tunneling Microscope(STM) contacted the surface of the V2O5 cathode of Li ion battery and provided a local chemical reaction of oxidation-reduction to the only few atoms under the tip. Spectroscopy by the UHV STM/AFM showed discrete peaks in a current at every specific voltage attributed to oxidation- reduction of the V atom. The energy of peaks observed in experiment correlated with peaks of high electron density of states known from Hartree-Fock calculations.

The structure of V2O5 film is important for electron and ion transport. The size of grains and their orientation in V2O5 film were studied before and after Li intercalation. This intercalation was performed using two methods. The voltage applied to the probe of UHV STM/AFM extracted Li from the anode and delivered Li through the electrolyte to V2O5 by the first method. Alternating deposition of thin films of Li and V2O5 was used as the second method of intercalation.

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