Carbon-coated Magnéli phases Ti_4O_7 as anodes in Lithium-Ion Batteries

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Titanium dioxide (TiO_2) has attracted great attention as a promising Li insertion electrode material in Lithium-Ion Batteries (LIBs) in view of its properties such as low cost, environmental friendliness, and higher Li-insertion potential (1.5–1.8 V vs. Li^+/Li) than the commercialized carbon anode materials. [1, 2]However, the low electronic conductivity of TiO_2 limits its applications in LIBs. Compared with the titanium dioxide, Magnéli phases Ti_nO_{2n-1} (where n is a number between 4 and 10) exhibits a higher electronic-conductivity.[3] Nevertheless, Magnéli phases Ti_nO_{2n-1} has no access for Li^+ to insert due to its special crystal structure, and it is a surface reaction for them to form rich lithium compound. So, the Magnéli phases Ti_nO_{2n-1} should possess large specific surface area for getting a high specific capacity. In the study, we describe our route to synthesizing carbon coated Ti_4O_7, which is used as the anodes in Lithium-Ion Batteries. The initial reversible capacity of the Ti_4O_7 based LIBs attained 175.6 $mAhg^{-1}$, and could stabilize at 145 $mAhg^{-1}$ after 25 cycles. The electrochemical performances of carbon coated Ti_4O_7 as the anodes in Lithium-Ion Batteries were studied in detail. It indicated that the excellent performance of Magnéli phases Ti_nO_{2n-1} as anodes in Lithium-Ion Batteries could be realized by optimizing the preparation method and the active materials in the study. These results provide further investigation on the Ti_nO_{2n-1}-based electrode materials for Lithium-Ion Batteries.

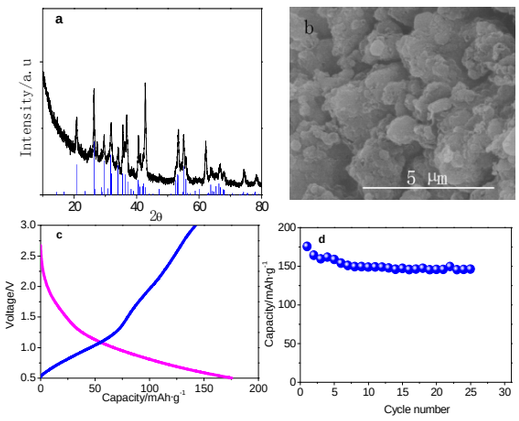

Figure1. (a) XRD spectrum of the carbon-coated Ti_4O_7; (b) SEM image of the carbon-coated Ti_4O_7; (c) The first discharge and charge profile of the carbon-coated Ti_4O_7 samples; (d) Cycle performances of the carbon-coated Ti_4O_7

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