Facile Synthesis of NH$_4$V$_3$O$_8$ Micro/Nanoplates and the Effects of Cutoff Potential on Electrochemical Performance

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NH$_4$V$_3$O$_8$ micro/nanoplates are synthesized using a hydrothermal method without any surfactant. The NH$_4$V$_3$O$_8$ micro/nanoplate cathodes show a high initial discharge capacity of 406 mAh g$^{-1}$, owing to the unique microscopic crystal structure and macroscopic 2D architectures, which enlarge the contacted area with the electrolyte solution. It is found that the voltage cutoff plays an important role in the capacity and cyclability. The lithium ion insertion site at 1.8 V causes the layered structure disorder/destruction, resulting in strong polarization and amorphization. In the suitable potential of 2-4 V, the reaction kinetics in NH$_4$V$_3$O$_8$ electrodes are not altered upon cycling, exhibiting improved cyclability and a high performance rate for lithium ion batteries.

Keywords: Ammonium trivanadate; Micro/nanoplates; Lithium ion battery; Cathode materials; Cutoff potentials

FULL TEXT

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