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Facile synthesis of TiP_2O_7/C nanoparticles as a competitive anode for aqueous lithium ion batteries

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Abstract:

TiP_2O_7 is an applicable anode for aqueous Li ion batteries (ALIBs) for its suitable potential and competitive capacity. However, inferior cycling performance and rate capability owing to the poor ionic and electronic conductivities have greatly restricted its application in ALIBs. To tackle these issues, the strategies of nanostructuring and high quality carbon coating were developed in this work. TiP_2O_7/C nanoparticles with a size of *ca*. 50 nm have a high surface area of 41.07 $m^2 g^{-1}$. In this composite, TiP_2O_7 nanoparticle is well coated by a uniform carbon layer (thickness of *ca*. 10 nm and carbon content of 7.65 wt%). The as-obtained TiP_2O_7/C composite shows an excellent cycling performance (90.6% capacity retention after 100 cycles at 30 mA g^{-1} and 97.3% capacity retention after 600 cycles at 750 mA g^{-1}) and superior rate capability (97 mAh g^{-1} at 30 mA g^{-1} and 78 mAh g^{-1} at 300 mA g^{-1}). It is found that the intrinsically stable structure of TiP_2O_7 nanoparticles and the uniform carbon coating greatly contributed to their superior electrochemical properties in aqueous electrolyte.

Key words: aqueous lithium ion battery; TiP_2O_7/C; anode material; carbon coating; phenolic resin

1. Introduction

The rapid development of clean and sustainable economy is boosting the construction of advanced energy storage system with high energy/power density, low cost and good safety performance [1-4]. Conventional lithium ion batteries with

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