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Synthesis of Fe_3O_4@C Composites Using Cellulose and Ferric Tartrate Complex as Precursor and Their Application as Anode for High Performance Lithium-Ion Batteries

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Fe_3O_4 is a kind of promising anode material for lithium-ion batteries, however, the poor electrical conductivity and serious volume expansion limit their practical application in practice. In this article, the Fe_3O_4@C composite is prepared by facilely decomposing of the cellulose/ferric tartrate complex system. A ferric tartrate complex aqueous solution has been explored to dissolve cellulose. After a freeze-drying and subsequently carbonization at high temperature, ferric tartrate complex is decomposed to Fe_3O_4 and deposited homogenously inside the porous carbon derived from cellulose, obtaining the in-situ porous Fe_3O_4@C composites. The porous carbon can provide good electrical conductivity and adapt to the volume change of the Fe_3O_4 nanoparticles in electrochemical research. As LIB anode material, The Fe_3O_4@C anode delivers high initial charging capacity of 864.9 $mAh \cdot g^{-1}$ at 100 $mA \cdot g^{-1}$ and excellent cycling stability of 86.4% capacity retention after 300 cycles at 1000 $mA \cdot g^{-1}$.

Keyword: Cellulose, Ferric tartrate complex, Fe_3O_4@Carbon composite, Lithium-ion batteries.

FULL TEXT