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尖晶石型$Li_4Ti_5O_{12}$的合成及其性能

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Synthesis and Electrochemical Properties of Spinel $Li_4Ti_5O_{12}$

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摘要 采用高温固相法、溶胶-凝胶法和热聚合法制备锂离子电池负极材料$Li_4Ti_5O_{12}$.通过X-射线衍射、扫描电镜显微镜、电化学阻抗和恒流充放电表征产物的结构、形貌及电化学性能.3种方法制备的$Li_4Ti_5O_{12}$均为尖晶石结构，用高温固相法所得的粉体颗粒较大，而用溶胶-凝胶法所得粉体颗粒最小，其平均粒度在200~350 nm范围内，表现出较好的电化学性能；溶胶-凝胶法制备的样品粉末在0.2 C倍率下首次放电容量为174.5 mAh/g，经过25次循环后容量衰减仅5.7%.

关键词: 锂离子电池 负极材料 $Li_4Ti_5O_{12}$ 高温固相 溶胶-凝胶 热聚合

Abstract: The anode material $Li_4Ti_5O_{12}$ for Li-ion battery was synthesized by high temperature solid-state method,sol-gel method and thermal polymerization method.Its structural characterization,surface morphology and electrochemical performance of products were characterized by X-ray diffractometry,scanning electron microscopy,electrochemical impedance spectroscopy,and galvanostatic charge-discharge test.The result shows that $Li_4Ti_5O_{12}$ prepared by the three methods had perfect spinel structure.The powders prepared by high temperature solid-state were the biggest,while the powders prepared by sol-gel were the smallest with an average dimension of 200~350 nm and exhibited better electrochemical performance.Its initial specific discharge capacity was 174.5 mAh/g at 0.2 C rate,only reducing 5.7% after 25 cycles.

Key words: Li-ion battery anode material $Li_4Ti_5O_{12}$ high temperature solid-state sol-gel thermal polymerization

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