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研究论文

Mn4+--掺杂锂钒氧化物的合成及其电化学性能

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摘要： 以LiOH ? H2O、NH4VO3和Mn(CH3COO)2 4H2O为原料, 以柠檬酸(C6H8O7 ? H2O)为络合剂, 用凝胶溶胶法按xLiV3O8 yLiMn2O4(x:y=1:0, 4:1, 8:1, 12:1, 16:1)合成出锂离子电池正极材料Mn4+--LiV3O8, 并对其结构和电化学性能进行了研究。结果表明, 用该法制备的样品具有良好的层状晶体结构和良好的充放电性能。当x：y = 12：1时, 在1.8--3.8 V范围内以0.1 C 倍率循环时, 首次放电比容量高达387.9 mAh/g, 比未掺杂Mn4+时(299.9 mAh/g)提高了29.3%。经过30次循环后, 放电比容量仍保持为376.4 mAh/g, 充放电效率维持在97%以上。

关键词： 无机非金属材料 锂离子电池正极材料 掺杂 循环伏安 溶胶凝胶法

Synthesis and Electrochemical Performance of Mn4+ Doped Lithium Vanadium Oxide

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Abstract: According to the stoichiometric ratio of xLiV3O8 • yLiMn2O4 (x:y=1:0, 4:1, 8:1, 12:1, 16:1), lithium vanadium oxide Mn4+ – LiV3O8 was synthesized by a sol – gel method with LiOH • H2O, NH4VO3, Mn(CH3 COO)2 • 4H2O and C6 H8O7 • H2O as starting materials, and its electrochemical characterization and structure has been investigated. The results show that the Mn4+ – LiV3O8 made by sol – gel method has well – developed crystal structure of layered LiV3O8 and a good charge – discharge characterization. The initial discharge specific capacity with Mn4+ doping at x:y=12:1 reaches 387.9 mAh/g, which is 29.3% larger than that of pure material (299.9 mAh/g), and keeps 376.4 mAh/g after 30 cycles when cycles at 0.1C rate over the voltage range of 1.8 – 3.8 V. Further-more, the material preserves a high charge-discharge efficiency above 97%.

Keywords: inorganic non-metallic lithium-ion battery cathode material doping cyclic voltammogram sol-gel method

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