



## 层状正极材料 $\text{LiNi}_{0.5}\text{Co}_{0.25}\text{Mn}_{0.25}\text{O}_2$ 的结构及电化学行为 Structural Characteristics and Electrochemical Behavior of Layered $\text{LiNi}_{0.5}\text{Co}_{0.25}\text{Mn}_{0.25}\text{O}_2$ as Cathode Materials of Lithium Ion Batteries

摘要点击: 33 全文下载: 63

[查看全文](#) [查看/发表评论](#) [下载PDF阅读器](#)

中文关键词: 锂离子电池; 层状正极材料;  $\text{LiNi}_{0.5}\text{Co}_{0.25}\text{Mn}_{0.25}\text{O}_2$ ; 电化学性能

英文关键词: lithium ion batteries; layered cathode materials;  $\text{LiNi}_{0.5}\text{Co}_{0.25}\text{Mn}_{0.25}\text{O}_2$ ; electrochemical behavior

基金项目:

作者	单位
戴长松	哈尔滨工业大学材料科学与工程博士后流动站, 哈尔滨 150001; 哈尔滨工业大学应用化学系, 哈尔滨 150001
葛昊	哈尔滨工业大学应用化学系, 哈尔滨 150001
王殿龙	哈尔滨工业大学应用化学系, 哈尔滨 150001
王福平	哈尔滨工业大学材料科学与工程博士后流动站, 哈尔滨 150001

中文摘要:

采用溶胶-凝胶方法制备了正极材料 $\text{LiNi}_{0.5}\text{Co}_{0.25}\text{Mn}_{0.25}\text{O}_2$ 。XRD、XPS测试结果表明: $\text{LiNi}_{0.5}\text{Co}_{0.25}\text{Mn}_{0.25}\text{O}_2$ 中阳离子排列有序度较高,层状结构明显;Co、Mn分别以+3、+4价形式存在,Ni以+2、+3价形式存在,且 $\text{Ni}^{2+}$ 与 $\text{Ni}^{3+}$ 的含量之比约为1:1。SEM测试结果表明:正极材料 $\text{LiNi}_{0.5}\text{Co}_{0.25}\text{Mn}_{0.25}\text{O}_2$ 结晶粒径较均匀。充放电测试结果表明:与 $\text{LiCoO}_2$ 相比,尽管 $\text{LiNi}_{0.5}\text{Co}_{0.25}\text{Mn}_{0.25}\text{O}_2$ 的放电电压平台较低,但放电容量较高;在恒流充电模式下,当充电截止电压由4.35 V升高至4.75 V时,首次放电容量由 $179 \text{ mAh} \cdot \text{g}^{-1}$ 增至 $201 \text{ mAh} \cdot \text{g}^{-1}$ ,50次循环后,容量保持率由74.95%增至78.48%;在先恒流再恒压的充电模式下,电池首次放电容量为 $212 \text{ mAh} \cdot \text{g}^{-1}$ ,50次循环后,容量保持率提高到87.71%。循环伏安测试表明:在2.80~4.80 V扫描范围内,该正极材料发生 $\text{Ni}^{2+}/\text{Ni}^{3+}$ , $\text{Co}^{3+}/\text{Co}^{4+}$ 两对电化学反应。EIS测试表明:随着充电截止电压的增大,该正极材料的传荷电阻变小。

英文摘要:

Cathode materials of  $\text{LiNi}_{0.5}\text{Co}_{0.25}\text{Mn}_{0.25}\text{O}_2$  was synthesized by Sol-gel method in this study. XRD and XPS results reveal that the obtained  $\text{LiNi}_{0.5}\text{Co}_{0.25}\text{Mn}_{0.25}\text{O}_2$  exhibits a typical layered structure composed of highly ordered  $\text{Co}^{3+}$ ,  $\text{Mn}^{4+}$ ,  $\text{Ni}^{2+}$  and  $\text{Ni}^{3+}$ ; and the atom ratio of  $\text{Ni}^{2+}$  to  $\text{Ni}^{3+}$  is 1:1. A morphology of homogeneously distributed and well crystallized is observed by SEM. Compared with  $\text{LiCoO}_2$ , the resulted materials possess larger capacity and lower voltage plateau. It is also found that the initial discharge capacity and capacity retention of 50<sup>th</sup> cycle of  $\text{LiNi}_{0.5}\text{Co}_{0.25}\text{Mn}_{0.25}\text{O}_2$  increase from  $179 \text{ mAh} \cdot \text{g}^{-1}$  to  $201 \text{ mAh} \cdot \text{g}^{-1}$ , from 74.95% to 78.48%, respectively, when the cutoff voltage is changed from 4.35 V to 4.75 V. Under the discharge-charge model of initial constant current and subsequent constant voltage, an initial discharge capacity of  $212 \text{ mAh} \cdot \text{g}^{-1}$  can be achieved and the material keeps 87.71% of its initial capacity after 50<sup>th</sup> cycle. CV and EIS tests show that two redox couples of  $\text{Ni}^{2+}/\text{Ni}^{3+}$  and  $\text{Co}^{3+}/\text{Co}^{4+}$  are observed in the potential range of 2.80~4.80 V, and charge transfer resistance of the cathode decreases as the charge cutoff voltage increased.

[关闭](#)

您是第149248位访问者

主办单位: 中国化学会 单位地址: 南京大学化学楼

服务热线: (025)83592307 传真: (025)83592307 邮编: 210093 Email: [wjhx@netra.nju.edu.cn](mailto:wjhx@netra.nju.edu.cn)

本系统由北京勤云科技发展有限公司设计