吉首大学学报自然科学版 » 2011, Vol. 32 » Issue (1): 88-92 DOI:

正极材料$Li(Ni_{1/3}Co_{1/3}Mn_{1/3})_{1-x}Cr_xO_2$的合成与表征

（1.生态旅游应用技术湖南省重点实验室，湖南 吉首 416000；2.吉首大学化学化工学院，湖南 吉首 416000）

Synthesis and Performance of $Li(Ni_{1/3}Co_{1/3}Mn_{1/3})_{1-x}Cr_xO_2$ Anode Materials of Lithium-Ion Battery

(1.Hunan Key Lab of Bio-Tourism Application Technology,Jishou 416000,Hunan China;2.College of Chemistry and Chemical Engineering，Jishou University，Jishou 416000,Hunan China)

全文: PDF (846 KB) HTML (1 KB) 输出: BibTeX | EndNote (RIS) 背景资料

摘要 采用草酸盐共沉淀法合成一系列的$Li(Ni_{1/3}Co_{1/3}Mn_{1/3})_{1-x}Cr_xO_2$正极材料($0 \leqslant x \leqslant 0.1$)，用X射线衍射仪（XRD）和扫描电子显微镜（SEM）分析合成产物的晶体结构及表面形貌；利用充放电仪测定了产物的电化学性能.结果表明，合成的$Li(Ni_{1/3}Co_{1/3}Mn_{1/3})_{1-x}Cr_xO_2$($x$ = 0.01，0.03,0.05，0.07) 均保持α-$2NaFeO_2$层状结构相，属于空间R3m点群.$Li(Ni_{1/3}Co_{1/3}Mn_{1/3})_{0.95}Cr_{0.05}O_2$的电化学性能最佳，首次放电容量达158.6 mAh/g，在2.5～4.5 V区间30次循环后比容量衰竭率仅为3.92%.$Li(Ni_{1/3}Co_{1/3}Mn_{1/3})_{0.95}Cr_{0.05}O_2$和$Li(Ni_{1/3}Co_{1/3}Mn_{1/3})CrO_2$ 的电极阻抗变化不同，进而影响其电化学性能.

关键词： 锂离子电池 正极材料 掺杂 电化学性能

Abstract: A series of Li(Ni1/3Co1/3Mn1/3)1-xCrxO2 (0≤x≤0.1) samples were prepared as anode materials of lithium-ion battery by using oxalate co-precipitation method.The crystal structure and surface morphologies of the products were analyzed by means of X-ray diffraction（XRD）and scanning electron microscopy (SEM) methods.The electrochemical performance of Li(Ni1/3Co1/3Mn1/3)1-xCrxO2 was evaluated by charge/discharge tests.Results show that Li(Ni1/3Co1/3Mn1/3)1-xCrxO2(x=0.01，0.03,0.05，0.07) keeps bedded structure of α-2NaFeO2 and have cubic structure of phase R3m，The Li(Ni1/3Co1/3Mn1/3)0.95Cr0.05O2 has the best electrochemical performance，an initial discharge capacity of 158.6 mAh/g and the capacity fade is only 3.92 % after 30 cycles of charge-discharge within 2.5～4.5 V.The electrochemical circulation mechanism of the products was analyzed by means of ac impedance methods.Besides，Li(Ni1/3Co1/3Mn1/3)0.95Cr0.05O2 and Li(Ni1/3Co1/3Mn1/3)CrO2 electrodes had different changes of impedance，leading to different effects on the electrochemical performance.

Key words: lithium-ion battery anode materials mix performance

服务
- 把本文推荐给朋友
- 加入我的书架
- 加入引用管理器
- E-mail Alert
- RSS

作者相关文章
- 梁凯
- 莫如宝
- 刘建本
- 何则强

基金资助：

国家自然科学基金资助项目(20873054)；国家高技术研究发展计划(863计划)重点项目子课题(2010AA065205)；湖南省教育厅科学研究项目(10A098)；生态旅游应用技术湖南省重点实验室开放基金项目(10stlvzd06)；吉首大学林产化工工程湖南省重点实验室开放基金项目资助(JDZ200907)；吉首大学大学生研究性学习和创新性实验计划项目资助(JSU-CX-2010-55)

作者简介：梁凯(1985-),男,湖南常德人，吉首大学化学化工学院硕士研究生，主要从事功能材料研究.

引用本文:

梁凯,莫如宝,刘建本等. 正极材料$Li(Ni_{1/3}Co_{1/3}Mn_{1/3})_{1-x}Cr_xO_2$的合成与表征[J]. 吉首大学学报自然科学版, 2011, 32(1): 88-92.

LIANG Kai,MO Ru-Bao,LIU Jian-Ben et al. Synthesis and Performance of $Li(Ni_{1/3}Co_{1/3}Mn_{1/3})_{1-x}Cr_xO_2$ Anode Materials of Lithium-Ion Battery[J]. Journal of Jishou University（Natural Sciences Edit, 2011, 32(1): 88-92.

[1] ZHENG J M,LI J,ZHANG Z R,et al.The Effects of TiO2 Coating on the Electrochemical Performance of Li[Li0.2Mn0.54Ni0.13COM0.13]O2 Cathode Material for Lithium-Ion Battery [J].Solid State Ionics,2008,179:27-32.

[2] RANDOLPH A L.A Study of the Overcharge Reaction of Lithium-on Batteries [J].Journal of Power Sources,2001(97/98):681-683.

[3] 顾惠敏,翟玉春,田彦文,等.锂离子电池正极材料LiNiO2的结构和性能 [J].材料研究学报,2007,21(1):97-101.

[4] ZHAO Shi-xi,LIU Han-xing.Synthesis and Structure Transformation of Orthorhombic LiMnO2 Cathode Materials by Sol-Gel Method [J].Journal of Materials Science & Technology,2004,20(1):46-48.

[5] 李鹏,韩恩山,徐宁,等.LiMn1/3Co1/3Ni1/3O2的合成及性能 [J].电源技术,2005,129(8):511.

[6] 李义兵,陈白珍,徐徽,等.Li(Mn1/3Ni1/3Co1/3)1-yMyO2 (M =Al，Mg，Ti) 正极材料的制备及性能 [J].中国有色金属学报,2006,16(8):1 474.

[7] 吴晓梅,杨清河,金忠,等.锂离子电池阴极材料尖晶石结构Li1+xMn2-xO4的研究 [J].电化学,1998,4(4):366-370.

[8] 张会琴,黄晓琴,黄俊芳.锂离子电池层状正极材料研究进展 [J].武汉生物工程学院学报,2007,3(3):179-182.

[9] 贺周初,庄新娟,彭爱国.锂离子电池正极材料尖晶石型锰酸锂的研究进展 [J].精细化工中间体,2010,40(1):7-11.

[10] LI Guo-hua,IKUTA H,UCHIDA T,et al.The Spinel PhasesLiMyMn2-yO4(M = Co,Cr,Ni) as the Cathode for Rechargeable Lithium Batteries [J].J.Elctrochem Soc.,1996,143:178-182.

[11] LUO X F,WANG X Y,LI L,et al.Synthesis and Characterization of High Tap-Density Layered Li[Ni1/3Co1/3Mn1/3]O2 Cathode Material Via Hydroxide Co-Precipitation [J].Journal of Power Sources,2006,158(1):654-658.

[12] 贺慧,程璇,张颖.锂离子电池正极材料的研究进展 [J].功能材料,2004,35(6):667-671.

[13] 杨照军，吴伯荣,张存中，等.能材料锂离子电池正极材料氟化处理研究进展 [J].功能材料,2010,35(7)：193-200.

[14] GADJOV H，GOROVA M，KOTZEVA V，et al.LiMn2O4 Prepared by Different Methods at Identical Thermal Treatment Conditions:Structural,Morphological and Electrochemical Characteristics [J].Power Sources，2004，134：110-117.

没有找到本文相关文献