

### 论文摘要

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## 钴掺杂锰酸锂的合成与性能

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**摘要:** 通过X射线衍射(XRD)、扫描电镜(SEM)、粒度分析以及充放电性能测试对固相烧结法制备的 $\text{LiCo}_x\text{Mn}_{2-x}\text{O}_4$  ( $x=0, 0.05, 0.10, 0.15, 0.20$ ) 结构、形貌进行表征, 并对电化学性质进行研究。研究表明,  $\text{LiCo}_x\text{Mn}_{2-x}\text{O}_4$  ( $x=0, 0.05, 0.10, 0.15, 0.20$ ) 均为单一尖晶石结构, 无杂相存在; 晶格常数随着掺杂量 $x$ 的增大而线性减小; 钴掺杂有助于 $\text{LiCo}_x\text{Mn}_{2-x}\text{O}_4$ 晶体更规则地生长, 使一次颗粒呈现八面体结构; 掺钴对 $\text{LiCo}_x\text{Mn}_{2-x}\text{O}_4$ 的平均粒径无明显影响; 纯 $\text{LiMn}_2\text{O}_4$ 在循环过程中容量衰减快, 钴掺杂明显地改善了 $\text{LiMn}_2\text{O}_4$ 充放电循环性能, 且大电流放电能力提高; 随着掺钴量的提高, 大电流充放电性能与循环过程中容量的保持率也提高。

**关键字:** 锂离子电池; 锰酸锂; 尖晶石; 钴掺杂; 正极材料

## Preparation and electrochemical characterization of Co-doping lithium manganese oxide

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**Abstract:** Properties of  $\text{LiCo}_x\text{Mn}_{2-x}\text{O}_4$  ( $x=0, 0.05, 0.10, 0.15, 0.20$ ) synthesized by solid state reaction were studied in the aspects of structure, and electrochemistry using X-ray diffractometry(XRD), scanning electronic microscopy(SEM), distribution of particle size and charge-discharge measurement. The results show that the pure phase exists with the same structure as spinel to all samples with and without cobalt-doping, not containing other minor impurity. The linear relationship of lattice parameter and Co-doping amount for  $\text{LiCo}_x\text{Mn}_{2-x}\text{O}_4$  is determined by powder XRD refinement. The more regular octahedral morphology of primary particles is observed under scanning electron microscope, which indicates the doping of cobalt is beneficial to the growth of crystal. However, the particle size is not affected by cobalt doping. The cycleability and the rate capability are greatly improved by the introduction of cobalt to the lattice. The more the amount of manganese is substituted by cobalt, the higher the capacity retention and more excellent rate capability are obtained.

**Key words:** lithium ion batteries; lithium manganese oxide; spinel; cobalt doping; cathode materials

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