Influence of Al and Mn on the electrochemical performance of $\text{LiNi}_x\text{Co}_y\text{M}_{1-x-y}\text{O}_2$ as a cathode for Lithium-Ion Batteries

Kai Yang, Min Zeng*, Xin Wu, Yuqing Zhang, Yuan Bai

School of Materials Science and Engineering, Southwest University of Science and Technology,
Mianyang 621010, P R China

*E-mail: zengmin@swust.edu.cn

doi: 10.20964/2019.09.73

Received: 9 May 2019 / Accepted: 15 July 2019 / Published: 5 August 2019

Ternary cathode materials possess splendid application prospects in lithium-ion batteries. In this paper, cathode materials of $\text{LiNi}_{0.8}\text{Co}_{0.1}\text{Mn}_{0.1}\text{O}_2$ (811), $\text{LiNi}_{0.8}\text{Co}_{0.1}\text{Mn}_{0.05}\text{Al}_{0.05}\text{O}_2$ (811-Al) and $\text{LiNi}_{0.8}\text{Co}_{0.15}\text{Al}_{0.05}\text{O}_2$ (NCA) were prepared by a simple coprecipitation reaction. At the same time, to further explore how to improve the performance of the nickel-rich material, different elements and non-proportional substitutions were used to observe the charge/discharge performance of the battery. The 811 materials were found to have a capacity of 163 mAhg^{-1} and, after 100 cycles at a rate of 0.1°C , maintained a capacity of 135 mAhg^{-1} , which represented a capacity retention of 82.7 %. On the other hand, the Al-substitution 811 materials were found to have low cycle performance and poor rate performance. These results indicate that Al and Mn in ternary materials have great differences in stabilizing the structure and properties of materials. As a result, the high-energy, high-density lithium-ion battery has great development potential at present.

Keywords: Cathode material, $\text{LiNi}_{0.8}\text{Co}_{0.1}\text{Mn}_{0.1}\text{O}_2$, NCA, Lithium-ion battery

[FULL TEXT](#)

© 2019 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).