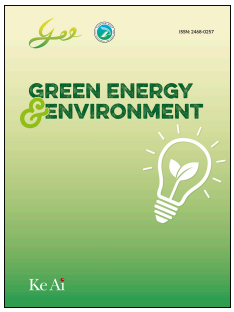
Accepted Manuscript



A closed-loop process for recycling $LiNi_xCo_yMn_{(1-x-y)}O_2$ from mixed cathode materials of lithium-ion batteries

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PII: S2468-0257(16)30062-0

DOI: 10.1016/j.gee.2016.11.010

Reference: GEE 39

To appear in: *Green Energy and Environment*

Received Date: 11 September 2016

Revised Date: 24 November 2016

Accepted Date: 25 November 2016

Please cite this article as: R. Zheng, W. Wang, Y. Dai, Q. Ma, Y. Liu, D. Mu, R. Li, J. Ren, C. Dai, A closed-loop process for recycling $LiNi_xCo_yMn_{(1-x-y)}O_2$ from mixed cathode materials of lithium-ion batteries, *Green Energy & Environment* (2017), doi: 10.1016/j.gee.2016.11.010.

A closed-loop process for recycling $LiNi_xCo_yMn_{(1-x-y)}O_2$ from mixed cathode materials of lithium-ion batteries

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Abstract

With the rapid development of consumer electronics and electric vehicles (EV), a large number of spent lithium-ion batteries (LIBs) have been generated worldwide. Thus, effective recycling technologies to recapture a significant amount of valuable metals contained in spent LIBs are highly desirable to prevent the environmental pollution and resource depletion. In this work, a novel recycling technology to regenerate a $LiNi_{1/3}Co_{1/3}Mn_{1/3}O_2$ cathode material from spent LIBs with different cathode chemistries has been developed. By dismantling, crushing, leaching and impurity removing, the $LiNi_{1/3}Co_{1/3}Mn_{1/3}O_2$ (selected as an example of $LiNi_xCo_yMn_{(1-x-y)}O_2$) powder can be directly prepared from the purified leaching solution *via* co-precipitation followed by solid-state synthesis. For comparison purposes, a fresh-synthesized sample with the same composition has also been prepared using the commercial raw materials *via* the same method. X-ray diffraction (XRD), scanning electron microscopy (SEM) and electrochemical measurements have been carried out to characterize these samples. The electrochemical test result suggests that the re-synthesized sample delivers cycle performance and low rate capability which are comparable to those of the fresh-synthesized sample. This novel recycling technique can be of great value to the regeneration of a pure and marketable $LiNi_xCo_yMn_{(1-x-y)}O_2$ cathode material with low secondary pollution.

Keywords: Spent lithium-ion battery; Cathode material recycling; Acid leaching; Purification;

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