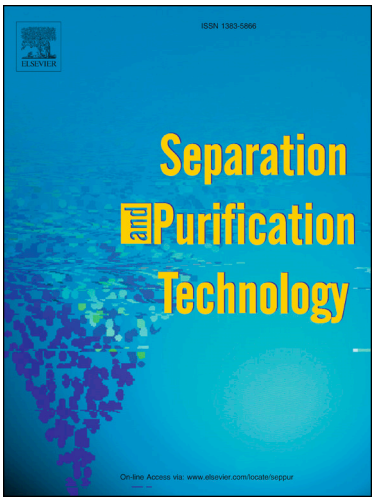

Recovery of lithium from spent lithium-ion batteries using precipitation and electrodialysis techniques

Yunfeng SONG, Zhongwei ZHAO

PII: S1383-5866(18)30931-6
DOI: https://doi.org/10.1016/j.seppur.2018.06.022
Reference: SEPPUR 14676

To appear in: *Separation and Purification Technology*

Received Date: 19 March 2018
Revised Date: 29 May 2018
Accepted Date: 7 June 2018

Please cite this article as: Y. SONG, Z. ZHAO, Recovery of lithium from spent lithium-ion batteries using precipitation and electrodialysis techniques, *Separation and Purification Technology* (2018), doi: https://doi.org/10.1016/j.seppur.2018.06.022

Recovery of lithium from spent lithium-ion batteries using precipitation and electrodialysis techniques

Yunfeng SONG [a,b], Zhongwei ZHAO* [a,b]

a. School of Metallurgy and Environment, Central South University, Changsha 410083, China

b. Key laboratory of Hunan Province for Metallurgy and Material Processing of Rare Metals, Changsha 410083, China

Abstract：At present, the projected demand for lithium calls for processing all viable resources especially secondary resources. This paper presents a promising approach for recovering lithium from low lithium high-salt solution which is usually produced in the spent LIBs recycling process. The solution was firstly purified, and then lithium was precipitated by phosphate, the effects of operating conditions on the Li_3PO_4 precipitation behaviors were evaluated. The results indicated that temperature is a more important factor than seed crystal or flocculant. After that, Li_3PO_4 was dissolved by acid as the anolyte, and electrodialysis with cation-exchange membranes was used to investigate the separation performance of Li and P. The results showed that Li and P was effectively separated by electrodialysis, and the P/Li mass ratio of the catholyte was reduced to 0.23 (6.5 times lower compared to a feed P/Li ratio of 1.48). Deep separation of lithium and phosphorus in the catholyte was achieved by raising pH to make the lithium precipitated with the permeated phosphorus. The lithium concentration of purified catholyte was 22.5 g/L and was used to prepare lithium carbonate. The Li_2CO_3 precipitation rate reached 88.3% at 80 ^oC under CO_3^{3-}/Li^+ molar ratio of 1.1:2. The final product of lithium carbonate was in accord with the standard specification (Li_2CO_3-0, GB/T 11075-2013).The results of this study provide an efficient and green cyclic process for recovering lithium from spent LIBs.

Keywords：Lithium recovery; Spent Li-ion battery; Separation; Lithium Phosphate; Electrodialysis

Corresponding author: Zhong-wei ZHAO; Tel: : +86-731-88830476; E-mail: zhaozw@csu.edu.cn