# Electrodialytic Recovery of Cobalt from Spent Lithium-Ion Batteries

M.M. Cerrillo-Gonzalez, M. Villen-Guzman, J.M. Paz-Garcia, C. Gomez-Lahoz, C. Vereda-Alonso, R. Garcia-Delgado, F. Garcia-Herruzo y J.M. Rodriguez-Maroto
*Department of Chemical Engineering, University of Malaga (Spain)*
*Facultad de Ciencias, Campus de Teatinos s/n. 29071, Málaga*
*juanma.paz@uma.es*

Recycling lithium-ion batteries has an increasing interest for economic and environmental reasons. Disposal of lithium-ion batteries imposes high risk to the environment due to the toxicity of some of their essential components. In addition to this, some of these components, such as cobalt, natural graphite and phosphorus, are included in the list of critical raw materials for the European Union due to their strategic importance in the manufacturing industry. Therefore, in the recent years, numerous research studies have been focused on the development of efficient processes for battery recycling and the selective recuperation of these key components.

$LiCoO_2$ is the most common material use in current lithium-ion batteries cathodes. In the current work, an electrodialytic method is proposed for the recovery of cobalt from this kind of electrode. In a standard electrodialytic cell, the treated matrix is separated from the anode and the cathode compartments by means of ion-exchange membranes. A cation-exchange membrane (CEM) allows the passage of cations and hinders the passage of anions, while the behaviour of anion-exchange membrane (AEM) does the opposite. A three-compartment electrodialytic cell has been designed and assembled, as depicted in the figure. In the central compartment, a suspension of $LiCoO_2$ is added.

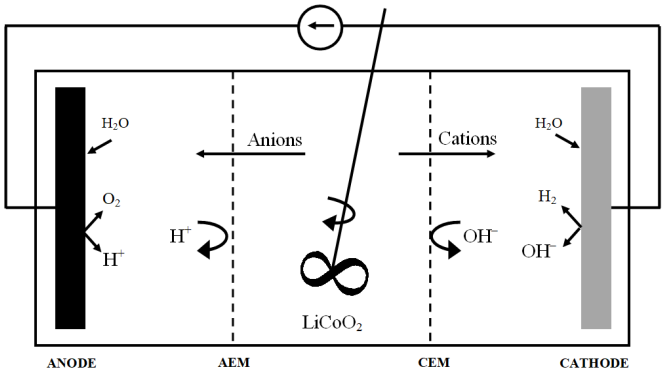


Figure: Scheme of the electrolytic cell for the recovery of cobalt from spent lithium-ion cells.

Different extracting agents, such as EDTA, HCl and $HNO_3$, are tested to enhanced the dissolution and the selective extraction of the target metal. Dissolved cobalt-containing complexes migrate towards the cathode or the anode compartments depending on the ionic charge of the complexes. While cobalt extraction via extracting agents is an expensive treatment, as it requires the constant addition of chemicals, an efficient electrodialytic cell could allow the recirculation of the extracting agents and the economical optimization of the process.

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