

## A Model for Electrodialytic Treatment of Lithium-Ion Batteries

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New recycling processes for secondary batteries are needed to achieve sustainable use of natural resources. Indeed, many components in lithium ion batteries, such as cobalt and graphite, are in the European Union's "Critical Raw Materials" list. Electrodialytic treatment of disposed lithium-ion batteries is a pioneer proposal for the selective recovery of some of these relevant elements.

In this work, a model for the electrochemical technology of disposed batteries implemented using COMSOL Multiphysics is presented. The main aim of this model is the optimization of the extraction of valuable components from spent batteries and the prediction of experimental results, which entails a better understanding of the different process involved. The model is based on the Nernst-Planck-Poisson system of equations coupled with the local chemical equilibrium conditions. The model uses multi-scale discretization of the different components; including the assumed well-stirred compartments, the ion-exchange membranes and the diffuse double-layer at the surface of the membranes. Different cell configuration has been tested, and results were compared to experimental data for model validation.

**Keywords:** Electrodialytic, Lithium-Ion and Batteries.

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