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Leaching of $LiCoO_2$ using H_2O_2 as reductant

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The growing use of Lithium-Ion batteries (LIBs) in the field of electric vehicles and renewable energy storage entails the production of toxic and environmental hazardous wastes. Furthermore, some components in these batteries are classified as Critical Raw Material due to their supply risk and economic importance. Hence, the development of more efficient process to recycle LIBs is gaining importance for economic aspects and environmental protection.

In this work, the hydrometallurgical leaching process for the recovery of valuable metals from the cathode active materials of spent LIBs batteries was evaluated. Batch Experiments were carried out using $LiCoO_2$ which is one of the most used cathodes in lithium-ion batteries. The selection of the extracting agent, its concentration, the reducing agent and the solid-liquid ratio are some of the parameters under study in this research.

Hydrochloric acid was used as the extracting agent and its concentration was modified from 0.1 M to 2.5 M while solid-liquid ratio (50 g/L), temperature (25 ºC) were fixed in all of them. The percentage of metal extracted was 31% of Co and 66% of Li for 0.1 M HCl solution. Extraction with 2.5M HCl solution was similar, 35% and 71% of Co and Li, respectively, but extracted in just 90 min, unlike the 72 h in the previous test. An experiment using H_2O_2 as a reducing agent was also performed, reaching a high percentage of metal extracted: 93% of Co and 100% of Li for a 0.6%vol of H_2O_2

Although tests have been carried out using $LiCoO_2$, the technique can be applied to different kinds of cathode from spent batteries. The results suggested that the recovery of Co and Li is viable at optimized experimental conditions. The results indicated clearly that the dissolution of $LiCoO_2$ particles is faster and more extensive when using more acidic extracting solution and stronger reducing agents, such as hydrogen peroxide. These results will be use in future stages of the investigation to design an optimized extraction procedure.

Keywords
Lithium-ion batteries, batteries recycling, acid leaching, reducing agents, kinetics

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