Recovery of Lithium and Cobalt from Waste Li-ion Batteries with a Newly Developed Method

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With the increase in the use of lithium-ion batteries, there is also increase in the waste of dead batteries which causes environmental problems. The recycling of lithium-ion batteries carries special importance for solving environmental problems and regaining of metals from batteries. The aim of this project is to recycle Li and Co from the cathode of waste lithium-ion batteries by a newly modified method decreasing the use of LiOH in the process, and to synthesize LiCoO 2 using recycled Co and Li to be used to build a new cathode and also to obtain a secondary lithium-ion battery with the graphite recovered from anode of the waste batteries. The waste cathode material was scraped firstly, then H 2 SO 4 and H 2 O 2 were added on it to dissolve Co and Li ions. After that, some precipitation steps have been followed with the supernatant to obtain Co and Li salts. Co and Li were obtained with 91,00% and 94,94% efficiencies respectively. The high-valued elements were recycled from waste lithium-ion batteries successfully using lower amount of LiOH which makes the process more feasible. A new lithium- ion battery with a discharge efficiency of over 86% was obtained from waste graphite. LiCoO 2 was synthesized succesfully for using it in building a new cathode. In the advanced stages of this study, a new cathode cell can be built using LiCoO 2 synthesized and analyzed for its life cycle. Finally, with the anode made of recyled graphite and the cathode newly built, a new battery can be obtained entirely from waste.

Awards Won:
Third Award of $1,000