

Investigation of the Physicochemistry in Leaching of Blackmass for the Recovery of Metals from Spent Lithium-Ion Battery

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Abstract : Lithium-ion battery is the technology of choice in the development of electric vehicles. This technology is now mature, although there are still many challenges to increase their energy density while ensuring an irreproachable safety of use. For this goal, it is necessary to develop new cathodic materials that can be cycled at higher voltages and electrolytes compatible with these materials. But the challenge does not only concern the production of efficient batteries for the electrochemical storage of energy since lithium-ion battery technology relies on the use of critical and/or strategic value resources. It is, therefore, crucial to include Lithium-ion batteries development in a circular economy approach very early. In particular, optimized recycling and reuse of battery components must both minimize their impact on the environment and limit geopolitical issues related to tensions on the mineral resources necessary for lithium-ion battery production. Although recycling will never replace mining, it reduces resource dependence by ensuring the presence of exploitable resources in the territory, which is particularly important for countries like France, where exploited or exploitable resources are limited. This conference addresses the development of a new hydrometallurgical process combining leaching of cathodic material from spent lithium-ion battery in acidic chloride media and solvent extraction process. Most of recycling processes reported in the literature rely on the sulphate route, and a few studies investigate the potentialities of the chloride route despite many advantages and the possibility to develop new chemistry, which could get easier the metal separation. The leaching mechanisms and the solvent extraction equilibria will be presented in this conference. Based on the comprehension of the physicochemistry of leaching and solvent extraction, the present study will introduce a new hydrometallurgical process for the production of cobalt, nickel, manganese and lithium from spent cathodic materials.

Keywords : lithium-ion battery, recycling, hydrometallurgy, leaching, solvent extraction

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