



## Technical bulletin

### Recovering critical metals from batteries with Eka<sup>®</sup> HP Hydrogen Peroxide

Limited availability of resources is one of the biggest challenges for the future of the lithium-ion batteries (LiB) industry. Critical raw materials such as lithium, nickel, cobalt, copper, and graphite come from geopolitically sensitive regions, making efficient recycling methods important to reduce risks in the supply chain. The hydrometallurgical process is an effective and economically viable method for metal recovery from battery black mass (BM) or pyrometallurgical slags (Figure 1).

In most hydrometallurgical processes, the leaching solution consists of a mixture of a strong acid (e.g.,  $H_2SO_4$ ) and a reducing agent such as hydrogen peroxide,  $H_2O_2$ . The process occurs at 50–90 °C for 60–240 minutes, yielding a leaching efficiency as high as 100%. Nouryon, as a leading supplier of hydrogen peroxide, is working to optimize the use of  $H_2O_2$  in recycling schemes of various recycling processes and lithium-ion battery chemistries.

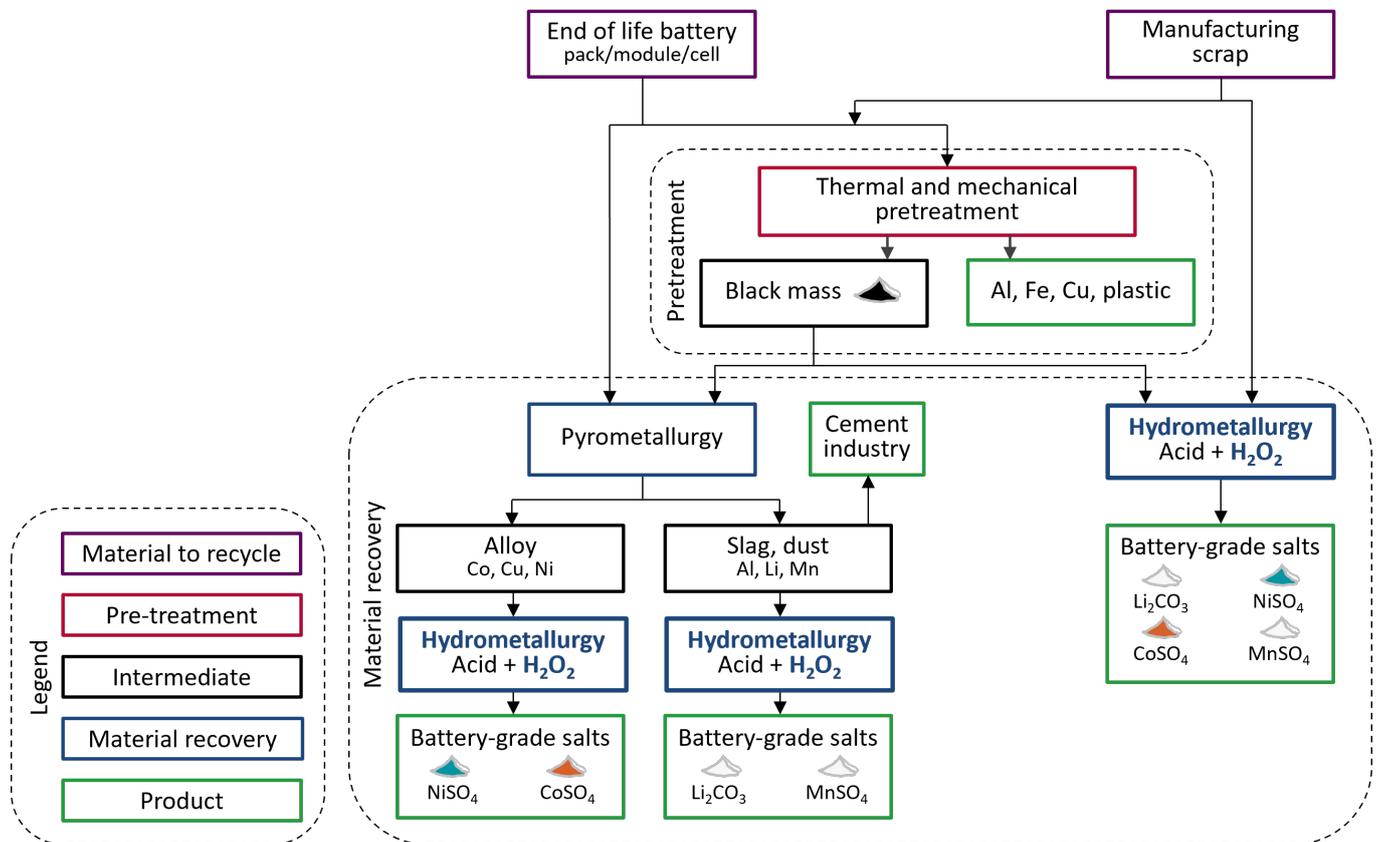


Figure 1. General recycling processes for NMC lithium-ion batteries



## Eka<sup>®</sup> HP – a sustainable solution for high leaching efficiency



The success of the hydrometallurgical process depends on the choice of the reducing agent. The reducing agent improves the solubility of metals by changing their oxidation states, forming more soluble cations (e.g., Reaction 1). Hydrogen peroxide has the advantage of combining high leaching efficiency (Figure 2, Table 1) with no by-product formation, which makes it an environmentally friendly reducing agent. Additionally, the high reactivity of H<sub>2</sub>O<sub>2</sub> allows the process to run at lower temperatures (50–70 °C), milder acidic conditions (≤1 M) and leaching times as short as 60 minutes.

Table 1. Metal leaching efficiency (%) for different types of commercial black mass samples. Sulfuric acid (1–2 M); Eka<sup>®</sup> HP (130–150 kg/t BM); temperature (50–70 °C); retention time (60–120 min.); solid-to-liquid ratio (1:10).

~NMC 111 non-thermally pretreated				~NMC 811 non-thermally pre-treated			
Li	Co	Ni	Mn	Li	Co	Ni	Mn
94	99	100	100	98	98	96	99
~NMC 622/LCO thermally pretreated				~NMC 811 thermally pretreated			
Li	Co	Ni	Mn	Li	Co	Ni	Mn
94	86	92	90	99	99	100	98

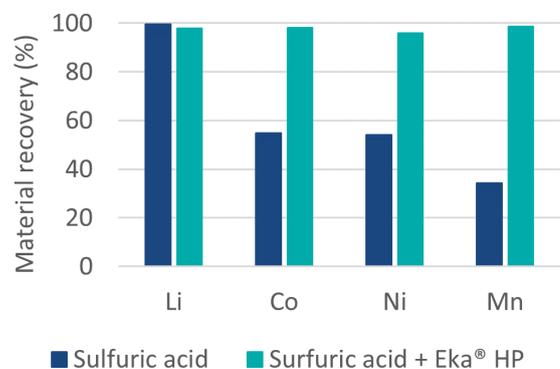


Figure 2. Metal recovery (~ NMC 811) with and without hydrogen peroxide (Eka<sup>®</sup> HP) addition

Reaction 1:



## Product

From production facilities in Sweden, Norway, USA, and Brazil, we offer our customers stabilized aqueous hydrogen peroxide solutions under the brand name Eka<sup>®</sup> HP.

As a bulk supplier, we offer mainly concentrations of 19%, 35%, 50%, 59%, and 70% delivered in ISO containers, railcars, and tanker trucks. Product grades, concentrations, and delivery alternatives vary by market. We also offer hydrogen peroxide with a near-zero carbon footprint, Eka<sup>®</sup> HP Puroxide<sup>™</sup>.

## Want to know more?

We look forward to supporting your battery black mass leaching operation, contact us:  
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