

## **Ni/Co recovery from ferronickel (FeNi) ores using an HCl-based route**

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The extraction of nickel (Ni) and cobalt (Co) is becoming increasingly crucial due to the rising global demand for these metals, driven by the expanding battery industry. The rapid decline in grades and depletion of reserves have further intensified the search for new Ni and Co sources globally. To ensure a sustainable supply of battery materials in Europe, the Horizon Europe-funded ENICON project (<https://enicon-horizon.eu/>) proposes an innovative HCl-based processing method. This project applies the principles of “Circular Hydrometallurgy” to minimize environmental impact and valorizes domestic European Ni and Co resources by converting Ni/Co ores, intermediates, and tailings into battery-grade metal salts, thereby enhancing the sustainability of the Ni/Co supply chain.<sup>1</sup> Ferronickel (FeNi), also known as Class-II Ni, is mainly used in the steel industry, and could be an alternative source for the production of battery-grade nickel (Class-I Ni). FeNi is produced by pyrometallurgical processing of nickeliferous laterite ores, and has a Ni content of around 20%. The oxidative leaching of FeNi has been investigated by varying temperature, solid/liquid ratio, HCl and H<sub>2</sub>O<sub>2</sub> concentration. The optimal conditions were identified (8 mol L<sup>-1</sup> HCl, 10 (v/v)% H<sub>2</sub>O<sub>2</sub> 30 wt.%, S/L= 110 g.L<sup>-1</sup>, 3 h, 60 °C), and were applied to provide the pregnant leach solution for subsequent purification by solvent extraction. For purification, undiluted tri-*n*-butyl phosphate (TBP) was used for iron removal and the simultaneous removal of most of the excess of HCl in four counter-current extraction stages, leaving Ni and Co in the raffinate for further processing into battery-grade metals or metal salts. The extracted FeCl<sub>3</sub> and HCl could be stripped and further processed to recover HCl and hematite (Fe<sub>2</sub>O<sub>3</sub>).

**Keywords:** Circular hydrometallurgy; Cobalt; Nickel; Oxidative leaching; Solvent extraction

### **REFERENCES**

[1] Binnemans, K.; Jones, P. T. The Twelve Principles of Circular Hydrometallurgy. *J. Sustain. Metall.* 2022, 9 (1), 1–25. <https://doi.org/10.1007/s40831-022-00636-3>

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