

Circular hydrometallurgical approach using hydrochloric acid towards the valorization of domestic European nickel and cobalt resources

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To secure future supply of battery materials in Europe, the valorization of domestic European nickel and cobalt resources is fundamental. With a focus on responsible mining, the Horizon Europe project ENICON develops an HCl-based flowsheet to convert Europe's Ni/Co ores (sulphides and laterites), intermediates (ferronickel, MSP, MHP) and tailings into battery-grade metal salts. This novel approach adheres to the principles of “Circular Hydrometallurgy” and will use industry-appropriate, inexpensive chemicals.¹ This includes, for instance, the recovery of HCl and iron by solvent extraction instead of neutralization or precipitation, respectively. The advantages of solvent extraction over “selective” precipitation are manifold: the final metal purity is much higher in the case of solvent extraction, less reagents are consumed and less waste is produced. Additionally, enhanced separation and purification of the Ni and Co-rich solutions obtained after the solvent extraction circuit by means of electrochemistry is promising, as only electricity would be needed to separate both elements, avoiding the use of excess chemicals and the production of waste streams. One constraint of this approach, however, is the need for prior removal of Mn and Al, as these cause contamination of the obtained products. Another approach investigated in the project is to implement the Co and Ni-rich streams after solvent extraction into already existing industrial processes, such as the chloride-based process at Nikkelverk’s Co/Ni refinery. Furthermore, the mineral residue obtained after HCl-leaching is used as additive in construction materials such as clinkers, concrete and cement. In conclusion, the ENICON process pursues the reduction of the CO₂-footprint of Ni and Co processing compared to the conventional processes, such as the environmentally harmful HPAL process used in Indonesia for Ni extraction from laterites. Moreover, it attempts to avoid waste streams and the consumption of large quantities of chemicals, while providing the metals for the future.

Keywords: Circular hydrometallurgy, Cobalt, Electro-oxidation, Hydrochloric acid, Nickel, Leaching, Solvent extraction

REFERENCES

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