

## PRODUCTION OF BATTERY GRADE NICKEL AND COBALT SULFATE FROM NICKEL LATERITE ORE

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### ABSTRACT

High-pressure acid leaching process (HPAL) is currently mainly used to treat nickel laterite ore, above 95% of Ni/Co leaching rate can be achieved by it. A two-stage pressure leaching process is developed to treat nickel laterite ore. After HPAL, instead of flash evaporation, the leached slurry is directly sent to the high-pressure neutralization unit, and continue to react with the added saprolite slurry. Utilizing the waste heat of 1<sup>st</sup> HPAL to neutralize residual sulfuric acid at slightly lower temperatures and pressures, as well as allowing newly generated iron to precipitate and release acid in the form of hematite, while achieving enhanced leaching of saprolite. Meanwhile, it further promotes the hydrolysis of Al<sup>3+</sup> and reduce the concentration of impurity Al in the neutralized solution. The pressure leached solution is subsequently treated by Fe/Al removal and Ni/Co precipitation. Mixed nickel-cobalt hydroxide (MHP for short) is obtained and used as raw material for refining.

The process for producing battery-grade nickel sulfate and cobalt sulfate from MHP generally includes sulfuric acid leaching, Fe/Al removal, impurities removal by SX, nickel and cobalt separation by SX, etc. At present, Fe/Al removal is mainly conducted by lime milk. This process is widely used, but there exist problems as follows: High Ni loss (~1.5%) due to high residue amount with high Ni content (6-12%); Saturated Ca ions are introduced into the solution. Calcium sulfate crystals will precipitate during P204 impurities removal, which will cause blockage and stoppage. In addition, most factories adopt 2 series of P507 SX to separate Ni/Co/Mg, which will lead to higher CAPEX and OPEX. A new process for Fe/Al removal and Ni/Co/Mg separation by SX is developed. Nickel/cobalt/manganese-based (MHP is preferred) neutralizer is used to remove Fe/Al, followed by L/S separation, the solution is sent for further impurities removal, the residue conducted by acid releaching-Fe/Al removal by lime milk for recovering Ni/Co and Fe/Al open circuit. In P507 SX, Ni saponification is used to control Na from entering to raffinate. After extraction by P507, Co and Mg is completely extracted to organic phase. Raffinate is battery grade Nickel sulfate solution. The loaded organic is scrubbed by many stages of acid solution scrubbing to remove Mg. Finally, the loaded organic is stripped by acid to obtain battery grade cobalt sulfate. In this case, Ni/Co/Mg is separated in one SX series. This new process reduces the dosage of lime milk, the amount of calcium ions introduced into the system and the losses of Ni/Co. The separation of Ni/Co/Mg is simplified as well.

**Keywords:** *Two stage pressure leaching, nickel laterite ore, NiSO<sub>4</sub>, CoSO<sub>4</sub>, Battery grade*