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CARBON NEGATIVE NICKEL AND COBALT PRODUCTION FROM NICKEL SAPROLITE ORES

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ABSTRACT

The demand for nickel and cobalt battery materials for transport is poised to increase exponentially. The natural resource to meet this demand is the large global resource base of saprolitic nickel ores

Atlas Materials have developed an innovative hydrometallurgical extraction process using hydrochloric acid leaching. The application of hot hydrochloric acid produces a residue that can be used as a supplemental cementitious material. The nickel, cobalt and magnesium containing leachate can be processed through a series of precipitation steps including (1) iron and aluminum removal, (2) mixed hydroxide precipitation for recovery of nickel and cobalt, (3) manganese rejection by oxidation/precipitation and finally (4) magnesium hydroxide precipitation. The precipitating agent is sodium hydroxide. At the end of the circuit, the spent electrolyte is essentially concentrated sodium chloride solution. This solution may be used as an input to a chlor-alkali facility to produce chlorine and hydrogen and caustic (NaOH). The chlorine and hydrogen are burned to make hydrochloric acid for recycle to leach. In this way, the chemical consumption of the process is low (mainly makeup NaCl). The process requires supply or renewable electricity for salt splitting. The overall process produces carbon negative nickel and cobalt to supply the EV battery sector.

The bench and pilot plant results for this process will be presented.

Several innovative additional technologies have been developed by Atlas and will be presented. A Direct Air Capture (DAC) module for carbon dioxide removal from air may be added to the main hydrometallurgical plant. Some of the caustic used in the process can be converted to sodium carbonate via DAC with sodium carbonate then used for selected process duties in the main plant. This will allow recovery of strong CO_2 gas streams for sequestration, adding to the carbon negative footprint of the overall process.

Keywords: Nickel, cobalt, MHP, saprolite, carbon negative, chlor-alkali, Direct Air Capture