

Meeting critical metals demand: The processing challenge

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High growth rates in specialty metals demand are driven by the battery sector. Lithium, graphite, cobalt, and specialty nickel chemicals are dominating the headlines from raw materials conferences to the journals of the automotive industries.

And it sounds so easy: Standard lithium processing involves either brines or hard rock resources. Spodumene, being the dominant economic mineral in lithium pegmatites, offers the benefit of shorter development times and higher flexibility in meeting specific battery demand. However, when examined more closely, lithium pegmatites also exhibit varying proportions of petalite, lepidolite, or lithium micas. These present processing challenges which impact the design of flotation circuits while variations in primary crystal size could affect the economic viability of dense media separation. Hydrometallurgical processing is introduced to achieve stringent specifications with regard to trace element concentrations and crystal design in lithium chemicals. To ensure maximum yield in both mineral concentration and metal extraction, tailor-made processing strategies are required, and this brings alternative types of deposit and new processing strategies into perspective.

For graphite deposits, this becomes even more obvious. Besides mineral concentration and chemical purification, efficient shaping of graphite flakes into spherical battery graphite particles is required. While purification of graphite into 99.95% purity is driven primarily by the kind of intergrowth with trace minerals, the aspect ratio, particle size and layer thickness are key variables in spheroidizing. While for lithium it is the chemical process that determines crystal size and shape of the product, graphite is subjected to efficient mechanical processing to turn flakes into dense spheres.

Since cobalt is a by-product of nickel and copper production, doubling the cobalt supply will force the development of unconventional, high-grade cobalt deposits to avoid flooding the host metals markets. As well as vein type deposits, such as the cobalt camp area in Ontario, new VMS, IOCG and metasedimentary-hosted cobalt deposits come into play. With added complexity of by-products in such deposits, long term experience in specialty metals process design, as opposed to standard copper and nickel processing, is pivotal to make the production of battery grade cobalt chemicals economically viable.

This presentation will take a closer look at challenges and opportunities in processing technology specifically focused on lithium, graphite, and cobalt.