Investigation of Flash Calciner Thermal Treatment of Lithium Ore

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ABSTRACT

The lithium market is driven by political decisions on reduction of vehicles with internal combustion engines and an increase in renewable energy use. Lithium is found in brines and hard rock deposits. As the demand for Lithium is growing, exploration of hard rock lithium deposits have recently been realized in several countries and the number of promising beneficiation projects is increasing.

The most frequent hard rock lithium source is spodumene. After several crushing and grinding steps and typically dense media separation one of the important process steps from spodumene concentrates to marketable lithium compounds such as lithium carbonate is the thermal treatment via decrepitation and roasting of the ore. Spodumene has a crystal chain structure which requires high temperature decrepitation at 1000° to 1100°C in order to change the non-extractable α-spodumene to a β-spodumene structure which is suitable for sulfate roasting and the following hydrometallurgical process chain.

Thyssenkrupp Industrial Solutions AG, a supplier of machines and EPC production lines in the mining industry, investigated at their R&D facilities the capabilities of different machines for lithium calcination. It is demonstrated by comparison to results of rotary kiln tests that the flash calcination technology POLCAL is fully capable of steady lithium conversion of fined grained materials at low residence times (<2 s) . During the tests product quality was analyzed using analytical methods such as true density, mineralogical assay and leaching showing almost complete conversion and a good correlation of conversion rate, true density as well as leaching data. The temperature profile inside of the calciner as well as the amount of feed material impurities (e.g. mica, feldspars and the iron content in amphibole) are found to be significant impacting factors on operation and therefore product quality.