

Flash calcination of fine spodumene concentrate

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ABSTRACT

Conventional rotary kilns used in spodumene decrepitation by calcination have difficulties in the processing of fine spodumene concentrates. Fine particles are more susceptible to melting in the kiln, rendering the lithium unrecoverable. The loss of fines as dust is another potential problem. Processing ores in which the spodumene is more disseminated, and the use of flotation to concentrate spodumene, results in finer grained concentrates. It is therefore necessary to develop alternative processes that can handle fine grained spodumene concentrates.

One alternative is flash calcination, where the material freefalls through a vertical shaft kiln. The grains are separated, and the $\alpha \rightarrow \beta$ spodumene transition occurs rapidly during the descent. A spodumene concentrate containing 6.0% Li_2O , with a size range of 90% passing 200 μm , was calcined in a Calix reactor, which is a new type of flash calcination kiln. Rapid conversion of α -spodumene to β -/ γ - spodumene was achieved using this new furnace, though multiple passes were needed to achieve good conversion percentages. Four passes at 1050°C resulted in 54% conversion, four passes at 1100°C resulted in 88% conversion, and two passes at 1120°C resulted in 84% conversion. When two different size fractions, -106 μm and +106 μm were treated under the same conditions (one pass, 1100°C) there was minimal difference in the extent of conversion.

Acid baking followed by water leaching of the calcined samples was run under a standard set of conditions: 180% stoichiometric acid requirement, 250°C for 1 h followed by 2 h of leaching in water at 50°C. Lithium extractions correlated closely with the extent of spodumene conversion of the calcined samples as measured by chemical and XRD methods.