

LieNA® SPODUMENE CAUSTIC CONVERSION PROCESS – INITIAL PILOTING

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ABSTRACT

In early 2020, Lithium Australia NL (LIT) was awarded \$1.3 million from the federal government's Department of Industry, Science and Technology CRC-P Round 8 program. The major objectives of the CRC-P program are to pilot (continuously) LIT's LieNA® caustic conversion process, support completion of a feasibility study and progress the LieNA® technology towards commercialisation.

ANSTO Minerals, which was the primary research provider in LIT's successful CRC-P Round 8 grant, has been working with LIT for the last four years on the extraction of lithium from sources of low-grade spodumene. Of particular interest as a feedstock to the LieNA® process is the spodumene contained in 'waste' streams produced during the processing of spodumene run-of-mine (ROM) ore. The LieNA® process technology, the result of this effort, allows the value contained within these low-grade and 'waste' streams to be realised.

With the development of hard-rock projects in Australia, it is becoming more widely known and better appreciated that the waste streams from these operations can contain up to 50% of the *in-situ* spodumene mineral; this results from loss and waste associated with achieving coarse particle size and the high feed grade specifications (+6% Li₂O) for conventional thermal processing of α-spodumene. Currently, spodumene reporting to waste streams is simply rejected to tailings. Even with high-quality spodumene ROM ore, ~30% of the spodumene can be lost to such waste streams. This represents a considerable loss of *in-situ* value, ultimately increasing the cost of production and reducing the sustainability of hard-rock lithium resources.

A key motivator in developing the LieNA® technology has been the desire to develop a process that removes the need for thermal processing of the α-spodumene as per the current conventional approach to refining, in order to reduce the environmental footprint of the process overall and further bolster the sustainability of hard-rock lithium resources.

The LieNA® technology involves a caustic digestion/conversion of low- or high-grade α-spodumene mineral concentrates under autoclave conditions – akin to alumina processing, which converts the α-spodumene to a mixed (Li/Na)-sodalite phase containing the majority of the lithium. The LieNA® process removes the requirement for thermal conversion of α-spodumene to β-spodumene, which is currently standard industry practice for refining of these concentrates.

Once converted, lithium hosted within the sodalite is extracted via a selective leach, undergoes minimal purification steps and, finally, precipitates lithium phosphate (Li₃PO₄). Recovery of lithium to lithium phosphate is excellent (>90%), with minimal production of (chemical) waste.

This presentation will briefly overview LieNA® process fundamentals and present outcomes from the LieNA® CRC-P Round 8 pilot plant operation at ANSTO Minerals. Information acquired as a result of pilot plant operation – particularly with respect to the installation, commissioning and operation of a 60-litre batch autoclave specifically procured for the LieNA® CRC-P Round 8 project – will be presented.

Keywords: lithium, spodumene, LieNA®, process development, batch autoclave, piloting, CRC-P