A NEW 'CLOSED' PROCESS FOR LITHIUM CHEMICALS PRODUCTION FROM SPODUMENE AND OTHER LITHIUM-SILICATE MINERALS

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ABSTRACT

Since 2015 Integrated Carbon Sequestration Pty Ltd (ICS) have been developing with CSIRO Mineral Resources at their Waterford (Perth) laboratories, a novel hard-rock lithium ore refining process. Patent applications with broad claims have been made in all major international jurisdictions, with the recent award of patents in the USA (10,131,968) and China.

Unlike legacy lithium ore refining processes in use, the new ICS Process is 'closed': the main chemical used, nitric acid, is recycled, while bases required are generated internally and fully recycled. Compared with legacy refineries, outlays for chemicals and disposing of their largely unwanted by-products are greatly reduced. Process development testwork to date foreshadows exceptionally high extractions of lithium values from spodumene concentrates, product purities, and overall yields of marketable lithium chemicals.

The initial product of the process is pure crystalline lithium nitrate. This may be decomposed to lithium oxide, the ideal precursor for production of lithium hydroxide monohydrate, lithium carbonate and even lithium metal. The off-gases from the decomposition of lithium nitrate are collected and re-converted to nitric acid for re-use in the Process. Savings from reduced raw materials needs alone, should exceed US$1,000 per tonne for lithium oxide monohydrate. Co-location of mine/concentrators and refineries becomes feasible, in which case the only materials to leave the site are final products. The Process also clears the way for the construction of the much larger refineries inevitably required to meet lithium demands for the world's substantial electrification of transport and conversion to renewable energy systems.

The latest results will be presented at the Conference: of process development and optimisation work at Waterford, and process modelling and feasibility studies currently underway, together with evolving plans for the first commercial-scale plant based on the Process.

Brief resume

Mr Hunwick's recent focus has been the development of a 'closed' process for producing high-purity lithium chemicals from the hard-rock mineral spodumene. This work draws upon an international career in process design, equipment design and marketing, and completing more than 100 business and corporate strategy assignments for clients in the power, other energy and heavy process industries over nearly half a century. A chemical engineer (BE Chem, Adel.), he also has an MBA from the AGSM, and is a member of the American Institute of Chemical Engineers (AIChE) and American Chemical Society (ACS)

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