Process for Extracting Low Mg/Li Ratio Lithium Salt Solution from High Mg/Li Ratio Brine Lake

Opportunity Statement

Lithium is one of the most commonly used metals in industry with a wide variety of applications including batteries, lubricating grease and pharmaceutical products. Demand for lithium is expected to rise with the increasing adoption of electric vehicles. Market reports have predicted that world lithium demand will increase by 2.5 times from 2010 to 2020. Therefore, there is a pressing need to develop new sources of lithium to support this anticipated increase in demand.

Lithium can be extracted from salt brine or minerals and then processed to obtain lithium carbonate, which is used to produce various lithium compounds. Salt brine is the most abundant lithium source available in the world, comprising about 60% of all known lithium deposits. Producing lithium by evaporating salt brine is also less costly than directly extracting it from minerals. This makes salt brine an important source of lithium to meet future market demand.

A major limitation of lithium extraction from salt brine is the difficulty in processing brine with a high magnesium to lithium (Mg/Li) ratio. It is important for the extracted lithium carbonate to have low magnesium content to avoid magnesium contamination in the downstream products. This makes lithium extraction from salt lakes with a high Mg/Li ratio a difficult task, as additional steps and costs are incurred to reduce the magnesium content of the brine solution to an acceptable level. The additional cost varies directly with the Mg/Li ratio, and it is industry practice to consider that a brine lake needs to have a Mg/Li ratio less than 10 to be a profitable venture.

Problem

The additional cost incurred using conventional processes to reduce the magnesium content in high Mg/Li ratio brine lakes restricts lithium extraction to low Mg/Li ratio brine lakes, and results in the underutilization of existing lithium resources.

Therefore, there is a need for a low-cost process which can extract low Mg/Li ratio lithium solution from high Mg/Li ratio brine lakes.

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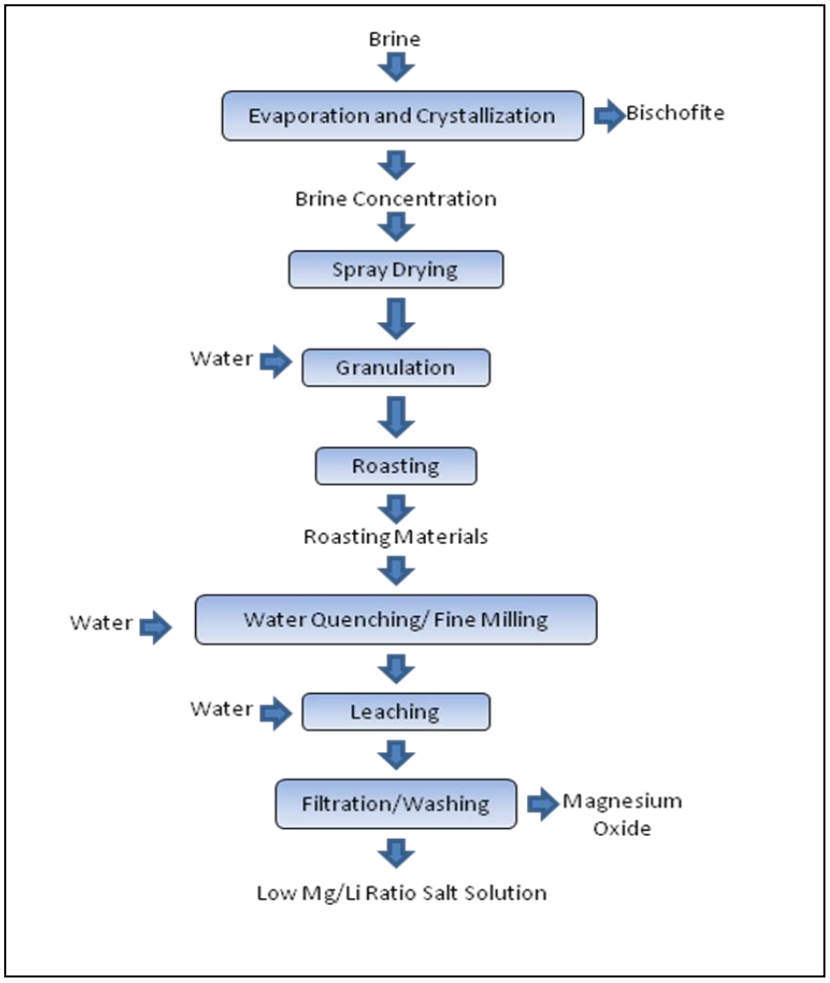
360ip Partner's Solution

360ip's partner has developed a technology which provides an integrated approach as shown below.



The process includes the following steps:

1. Evaporation and Crystallization – The brine solution is evaporated to produce concentrated brine solution and bischofite.
2. Spray Drying – The concentrated solution undergoes a spray-drying process at 400-600 °C. A portion of the magnesium chloride content in the solution is crystallized and hydrolyzed.
3. Granulation – Water is added to form crystallized grains from the spray-dried product.
4. Roasting – The crystals are roasted and a portion of the magnesium chloride content is hydrolyzed.
5. Water quenching and Leaching – Water is added to leach out the soluble lithium chloride and magnesium chloride.

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This process has been successfully applied to brine solution from a China brine lake with a Mg/Li ratio of 21 to produce a processed solution with a Mg/Li ratio of 0.41. The low Mg/Li ratio solution can be processed into lithium carbonate using standard commercially available process.

The key advantages associated with this technology are as follows:

- Crystallization process allows easy removal of crystallized magnesium with filtration and washing process.
- Utilization of a spray-drying process allows a significant amount of the magnesium chloride to be hydrolyzed at a lower temperature than normal.
- Low cost and high magnesium removal efficiency.

360ip is seeking interested parties for the licensing, further development and commercialization of this technology-based solution.

For additional information, contact:
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