Ellexco Abstract

Name of Team: Ellexco

Project Title: Direct Lithium Hydroxide Production from Geothermal Brines via an Integrated Electrochemical Process

Description and Impacts of project

Lithium ion batteries become ideal power supplies for cellphones, laptops, and electric vehicles. The national and international demand for Li is growing rapidly. The estimated demand for Li in 2030 is five times the size of the current Li supplies. Conventional lithium mining comes from hard rocks and salt flats. Current Li mining activities are concentrated in the lithium-triangle: Chile, Argentina, and Bolivia.

The United States urgently needs to develop domestic Li supply to ensure energy security. Unconventional resources like geothermal brine contains high concentrations of lithium and can potentially serve as domestic lithium source.

Existing methods for direct lithium extraction from the geothermal brine require significant chemical input. Solvent extraction needs organic solvent; adsorption and ion exchange require strong acid to get Li released. Processes with chemical input suffer from potential chemical toxicity, require further disposal of byproducts, require secondary processing to obtain the final product, and are environmentally unsustainable.

In comparison, electrochemical processes take the advantage of electricity as the only input without using chemicals, directly produce lithium hydroxide as the product, and generate no waste.

In our proposed integrated electrochemical process, silica is removed from the geothermal brine to prevent scaling, and the silica-free geothermal brine undergoes a selective extraction process to obtain lithium chloride. Finally, lithium hydroxide is produced via an electrochemical technology.

Our team is located at the heart of Washington DC and Chicago, with the strong facility and technical support from George Washington University and University of Chicago. Our team is highly experienced with ion separation technologies, and has pioneered the technology of direct lithium extraction using electrochemical method.

Ellexco offers a chemical-free, electricity-driven innovation to directly convert geothermal brine to lithium hydroxide. Our goal is to eliminate all chemicals used in lithium extraction, and make lithium extraction fast, highly selective, cost-effective, and environmentally friendly.

Objectives of Phase 2 submission.

During Phase 2, we have made significant advancement in demonstrating and improving the selectivity of our electrochemical methods and materials, conducting skid and module design for our lithium extraction systems, and conducting preliminary techno-economic assessments. We have also identified our goals in Phase 3.