

**Docket #:** S20-114

# **Lithium Extraction through Pulsed Electrochemical Intercalation Method**

Stanford researchers have developed a new electrochemical method for extracting lithium from low concentration sources such as seawater. Despite containing 5000x more lithium than land and brine-based resources, the presence of sodium (4x that of lithium) in seawater has made clean extraction of lithium difficult. By using a  $\text{TiO}_2$ -coated  $\text{FePO}_4$  to intercalate lithium into the electrode, researchers were able to achieve high selectivity for lithium. In cases where the Li/Na molar ratio is greater than  $10^{-3}$ , the diffusion barrier and thermodynamic intercalation potentials yield  $\sim 100\%$  Li selectivity over Na. However, for seawater or water with lower Li/Na ratios, the pulse sequence developed here yields Li selectivity  $\sim 1.8 \times 10^4$  over Na. The pulse sequence additionally helps to stabilize the crystal structure, prolonging the electrode lifetime. This improved lithium extraction method is critical as the demand for lithium-ion batteries increases in the coming decades.

## **Stage of Research**

- Proof of concept

## **Applications**

- **Lithium-ion battery materials**
- Lithium extraction

## **Advantages**

- **Lithium extraction from low concentration sources: seawater, lake water**
- Does not require pre-concentration of water into brine

## Publications

- Liu et al. Joule (2020) "[Lithium Extraction from Seawater through Pulsed Electrochemical Intercalation](#)"

## Patents

- Published Application: [WO2021188570](#)
- Published Application: [20230075724](#)

## Innovators

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