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Editorial

Lithium Derived from Seawater Using an Electrochemical Cell

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EDITORIAL

Lithium is a critical component of electric car batteries, but rising demand is predicted to deplete land-based lithium deposits by 2080. Researchers have devised a cost-effective technique for extracting high-purity lithium from seawater. The oceans have around 5,000 times the amount of lithium as land, although at extremely low concentrations of almost 0. Larger ions, such as sodium, magnesium, and potassium, are all present in considerably higher amounts in saltwater; nonetheless, prior attempts to extract lithium from this mix have yielded nothing.

An electrochemical cell with a ceramic membrane constructed of lithium lanthanum titanium oxide was used to tackle the problem. Its crystal structure has small pores that allow lithium ions to pass through while inhibiting bigger metal ions. "Lithium ions have never been extracted and concentrated using LLTO membranes before." There are three compartments in the cell. Positive lithium ions move through the LLTO membrane into a side compartment containing a buffer solution and a copper cathode plated with platinum and ruthenium as seawater flows into a central feed chamber. Meanwhile, negative ions move via a conventional anion exchange membrane and into a third compartment containing a sodium chloride solution and a platinum-ruthenium anode from the feed chamber.

The researchers put the device to the test with Red Seawater. The cell creates hydrogen gas at the cathode and chlorine gas at the anode at a voltage of 3.25V. Lithium is transported via the LLTO membrane and accumulates in the side-chamber as a result of this. This lithium-enriched water is then used as a feedstock for four additional processing cycles, eventually reaching a concentration of over 9,000 parts per million. By adjusting the pH of this solution, solid lithium phosphate is produced with only a few traces of other metal ions, pure enough to suit the demands of battery makers. The value of the hydrogen and chlorine produced by the cell would more than cover the cost, and leftover saltwater might be used in desalination plants to generate freshwater. "We will continue to optimize the membrane structure and cell design to improve the efficiency of the process," adds the lead researcher. His group also intends to work with the glass industry to mass-produce the LLTO membrane at a reasonable price.

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