URBAN SOLUTIONS AND SUSTAINABILITY R&D CONGRESS 2023

BUILDING SUSTAINABLE, RESILIENT, AND LIVEABLE CITIES OF TOMORROW

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INSPIRATIONS FROM SEAWATER LITHIUM EXTRACTION RESEARCH

Dr Lan Yihong

Director Suntar International Group









Inspirations from Seawater Lithium Extraction Research

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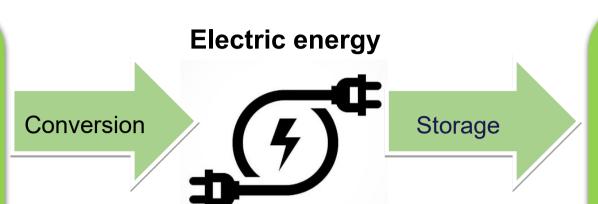
Director, Suntar International Group



Research Background and Project Introduction

Renewable energy

- Solar energy
- Ocean energy
- Biomass energy
- Wind energy
- Nuclear energy

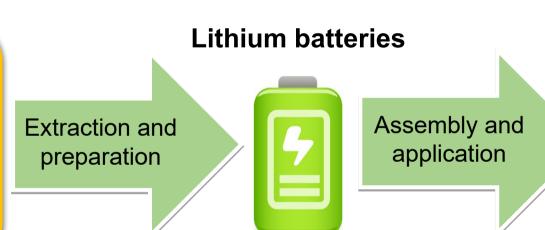


Energy storage devices

- Lithium batteries
- Lead batteries
- Flow cells
- Supercapacitors

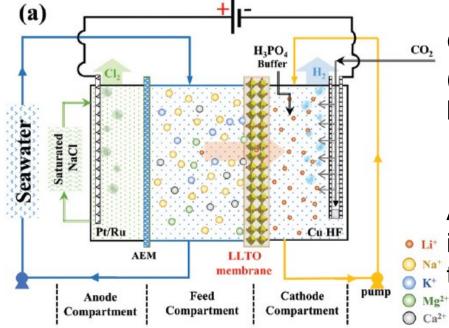
Lithium Sources

- Lithium minerals
- Brines
- Seawater





The total lithium reserves in seawater are about 23 B tons.



Glass-type Li-selective Li_{0.33}La_{0.57}TiO₃ (LLTO) is used to enrich Li in seawater by electrolysis.

After 5-step enrichment, Li concentration increases 43000 times, and the purity of the product, Li₃PO₄, attains 99.94%.





Issues

Mechanical strength of glass-type membrane?

Cost of glass-type LLTO membrane?

Energy consumption of 5-step enrichment?

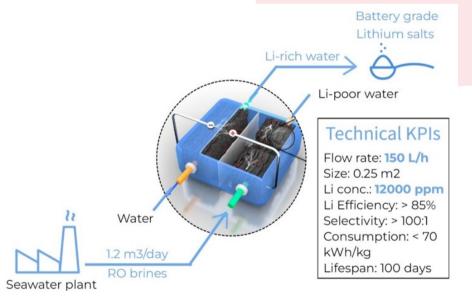
Solution

Higher mechanical strength and lower cost: Glass membrane → Ceramic membrane

Lower energy consumption: 5-step enrichment → 1-step enrichment

Objective

CWR-2101-0032 is awarded to study advanced LLTO/ceramic membranes for high-performance and low-cost Li mining from seawater.





Progress

Li concentration increases to 32 ppm, Na, K, Ca, and Mg concentrations decrease.

In the process of extracting Li from seawater, seawater desalination is achieved at the same time!

Comprehensive Seawater Utilization Suntar Techno-eco **Sea Salt** Li concentration **Battery Grade Lithium** (Product III) Li concentration **Crop Yield Enhancer Raw Materials** (Product IV) (Product X) **Membrane Permeation** How to improv •Crystallization Seawater lithiu Marine Brine (rich in **Animal Feed Additives Lithium Phosphate Flat Sheet Membrane** trace elements) (Product V) Feasibility / **Bioreactor Desalinated** Seawater **Artificial Hot Spring** Additives (Product VI) How to make **Clean Seawater Drinking water Marine Active** Chromatographic applications. **Ingredient Extracts Purification LLTO** (Product VII) **Ceramic Membrane Organic Nanofiltration** Inorganic Inorganic System **Ultrafiltration** Nanofiltration **System System** The role minera elements i **Desalinated Water by Precious Seafood Seawater** human bo **Nanofiltered Marine Trace Elements Nanofiltration Aquaculture Water** Seawater Concentrate (Product II) (Product I) (Product IX) (Product VIII)



Ocean Industrial Integration

Maximize the economic value of

desalination extracting minerals

like lithium and potassium from

brine byproduct, which would

also mitigate the ecological

Unlock the potential of the oceans as a renewable water source for human needs.

Seawater Desalination Comprehensive Seawater Utilization

Complementary

Integration

and Support

impact brine discharge on the ocean.

Offer solutions that combine policy and technology to promote sustainable marine development and facilitate marine ecological restoration.

Sustainable Ocean Governance Blue Economy Advancement

Drive the transformation and enhancement of the marine industry, fostering economic growth in harmony with nature.