Thesis proposals

2025 – 2026

FLUORITECH

Mechanochemical recovery of valuable materials from Li-ion batteries

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PROJECT

The production of energy storage system relies on different **critical raw materials**, including cobalt, lithium, nickel, manganese, graphite and copper. To ensure their future availability, it is essential to recover these material from spent batteries efficiently and sustainably.

GOALS

Optimization of the mechanochemical process for battery recovery and post-milling outcomes separation

DETAILS

Timeframe: 6-8 months
Start: Available from september
Outcomes: Paper/Patent

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FLUORITECH

Fluoride-ion batteries

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PROJECT

We need new, sustainable and low cost electrochemical energy storage devices.

The idea of making a **completely new type of battery based on fluoride ions exchange** can be the future for the electrical transition.

GOALS

Syntheses of liquid electrolytes and nanostructured transition metal fluorides as cathodic materials.

DETAILS

Timeframe: 4-6 months
Start: Available from now
Outcomes: Paper/Patent

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FLUORITECH

Fluorination of materials for lithium battery

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PROJECT

Society is demanding more and more for new energy storage solutions. We are developing a **new scalable solution fluorination process** based of the components for Lithium-based batteries able to overcome the actual limits.

GOALS

Syntheses and electrochemical test of fluorinated materials used in Lithium-based Batteries.

DETAILS

Timeframe: 4-6 months
Start: Available from now
Outcomes: Paper/Patent

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FLUORITECH

Fluorinated membranes for energy storage in biomedical applications

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PROJECT

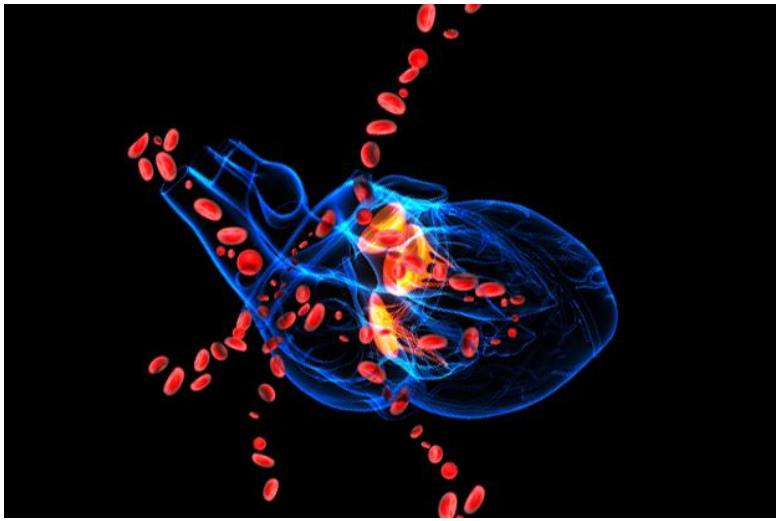
The advancement of implantable medical devices, such as peacemakers, defibrillators and continuous monitoring sensors, demands reliable, safe and long-lasting energy solutions. This experimental thesis aims to design and optimize new fluorinated membranes for the development of new technologies for electric energy storage, with a particular focus on advanced materials, miniaturization, and techniques to improve biocompatibility and safety.

GOALS

Design, synthesis and electrochemical characterization of a fluorinated membrane that exploits gradient in oxygen concentration

DETAILS

Timeframe: 6-8 months
Start: Available from now
Outcomes: Paper/Patent



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FLUORITECH

Mechanochemical Fluoride Synthesis for Mars In-Situ Resource Utilization

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PROJECT

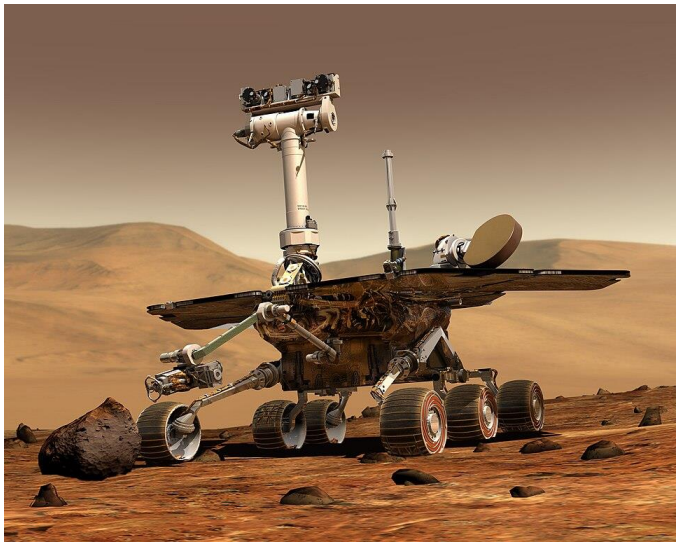
Mars is rich in aluminum as Al_2O_3, but extracting it requires high-temperature processes. **Cryolite-like fluorides** act as fluxes for alumina electrolysis, enabling in-situ aluminum production. This project aims to **mechanochemically synthesize** $Ca_3Al_2F_{12}$ from alumina and fluorite (minerals available on Mars), a solvent-free milling process suitable for the anhydrous Martian environment.

GOALS

Develop a solvent-free, low-energy route for the **in-situ production of cryolite fluoride compounds** essential for Al extraction and processing directly on Mars.

DETAILS

Timeframe: 6-8 months
Start: Available from now
Outcomes: Paper/Patent



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