

The HighMag Consortium

HighMag is a collaborative initiative bringing together a distinguished consortium of thirteen academic institutions and industry partners from across Europe and Israel. This diverse group represents a wealth of expertise and innovation in battery technology.



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IMPERIAL



HighMag: Building a sustainable, high-performance future for energy storage.



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the European Union

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HighMag



High-energy, low-cost and scalable generation 5 magnesium-based batteries for mobility applications and beyond

HighMag Project:
**Pioneering Sustainable
Battery Solutions**

The Energy Challenge

Global decarbonisation needs better energy storage. Current **Lithium-ion batteries (LIBs)** face growing concerns:

- ▶ **High Cost**
- ▶ **Limited Raw Materials**
- ▶ **Recycling Issues**
- ▶ **Safety Concerns**

HighMag addresses these challenges by developing **Rechargeable Magnesium Batteries (RMBs)** – a "Generation 5" solution.

Why Magnesium?

Magnesium offers compelling advantages:

Abundant & Affordable

Far more plentiful than lithium, leading to lower environmental and economic costs.

High Energy Density

More compact, powerful batteries.

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Sustainability

Built on Safe and Sustainable by Design (SSbD) principles.

HighMag's Innovative Technology

Advanced RMBs are being developed with two cathode chemistries:

Mg-S

Magnesium-Sulphur Batteries:

High-capacity conversion cathodes using abundant, low-cost sulphur.

MMBs

Magnesium Metal Batteries:

High-voltage insertion cathodes leveraging multivalent Mg^2 for increased capacity, utilising inexpensive magnesium.

Both systems will feature a **novel powder-based anode** with protective coatings, enhancing performance and safety.

Advancing from Lab to Application

HighMag's approach is comprehensive:



Core Components

Developing sustainable, PFAS-free electrolytes and functionalised separators.



Performance

Integrating electrocatalysts and protective coatings.



Fundamental Understanding

Using advanced operando characterisation.



Manufacturability

Ensuring compatibility with existing Li-ion production for easy scale-up.



Commercialisation

Developing business guidelines to support the EU battery industry.

Mg-based technology will advance from TRL 2 to TRL 4, targeting EUCAR Level 3 for mobility applications.