Advanced Mg–Li Hybrid Batteries

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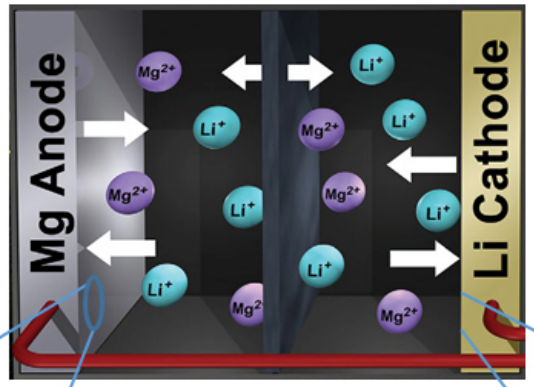
Mg–Li Hybrid Battery

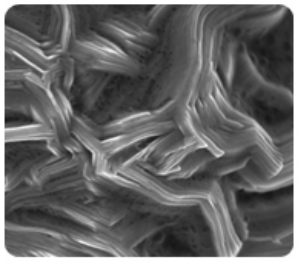


Redox Reactions:

Anode: $Mg \leftrightarrow Mg^{2+} + 2e^-$

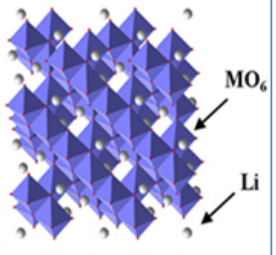
Cathode: $2Li^+ + 2e^- + 2MO_x \leftrightarrow 2LiMO_x$

Overall: $Mg + 2Li^+ + MO_x \leftrightarrow 2LiMO_x + Mg^{2+}$



Mg metal anode
- Dendrite free
- ~ 100% efficiency
- Low cost material
- Excellent safety
- 3832 mAh/cm^3

Lithium cathode
- Fast kinetics
- High efficiency
- Good safety
- Well established
- Potentially extend to Mg^{2+}/Li^+ co-insertion



Li Cathodes:
TiO_2, Mo_6S_8, TiS_2, LTO;
LFP, LMO;
S, FeS_x;

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Summary

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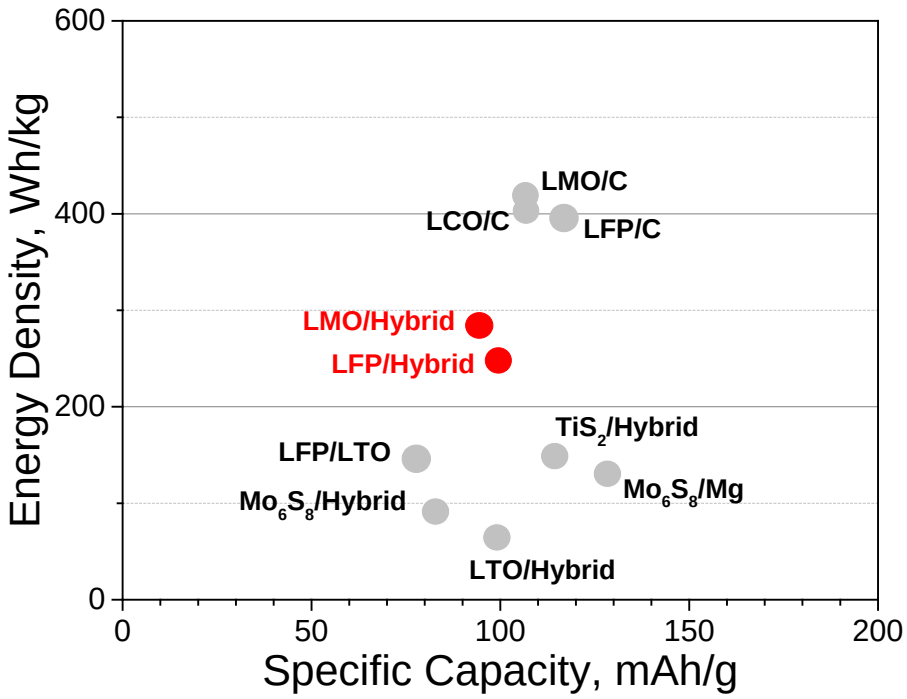
- Develop a stable and safe dual salt electrolytes. Electrochemical window up to 3.4 V vs Mg.
- Demonstrate a high voltage (~2.6 V) Mg–Li hybrid battery technology using LFP cathode.
- High energy density (~246 Wh/kg) Mg–Li hybrid battery was demonstrated.
- More cost effective hybrid batteries (such as Mg–Na battery) are under development.



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