APPROACH

High-power LIBs enabled by ion/electron-conducting additive

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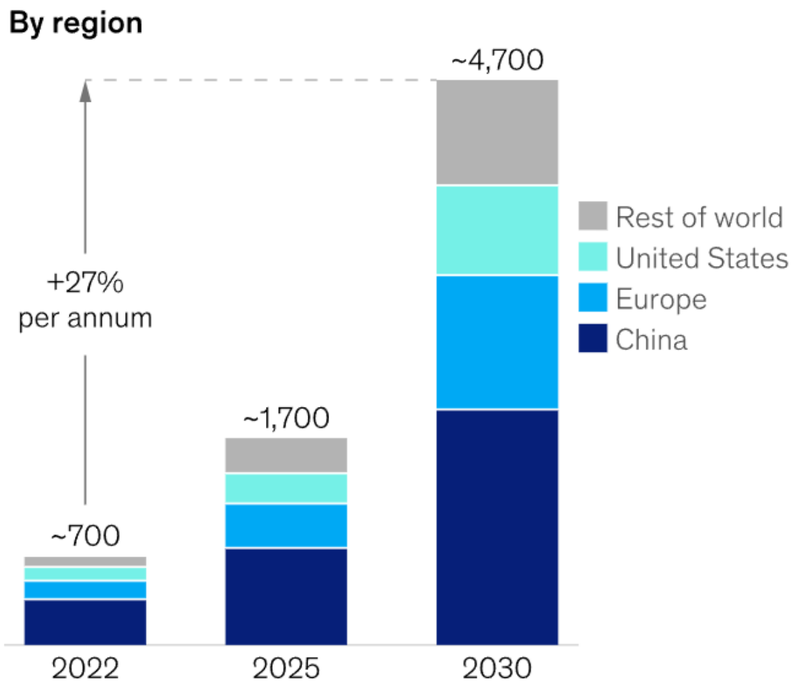
Market for lithium-ion batteries

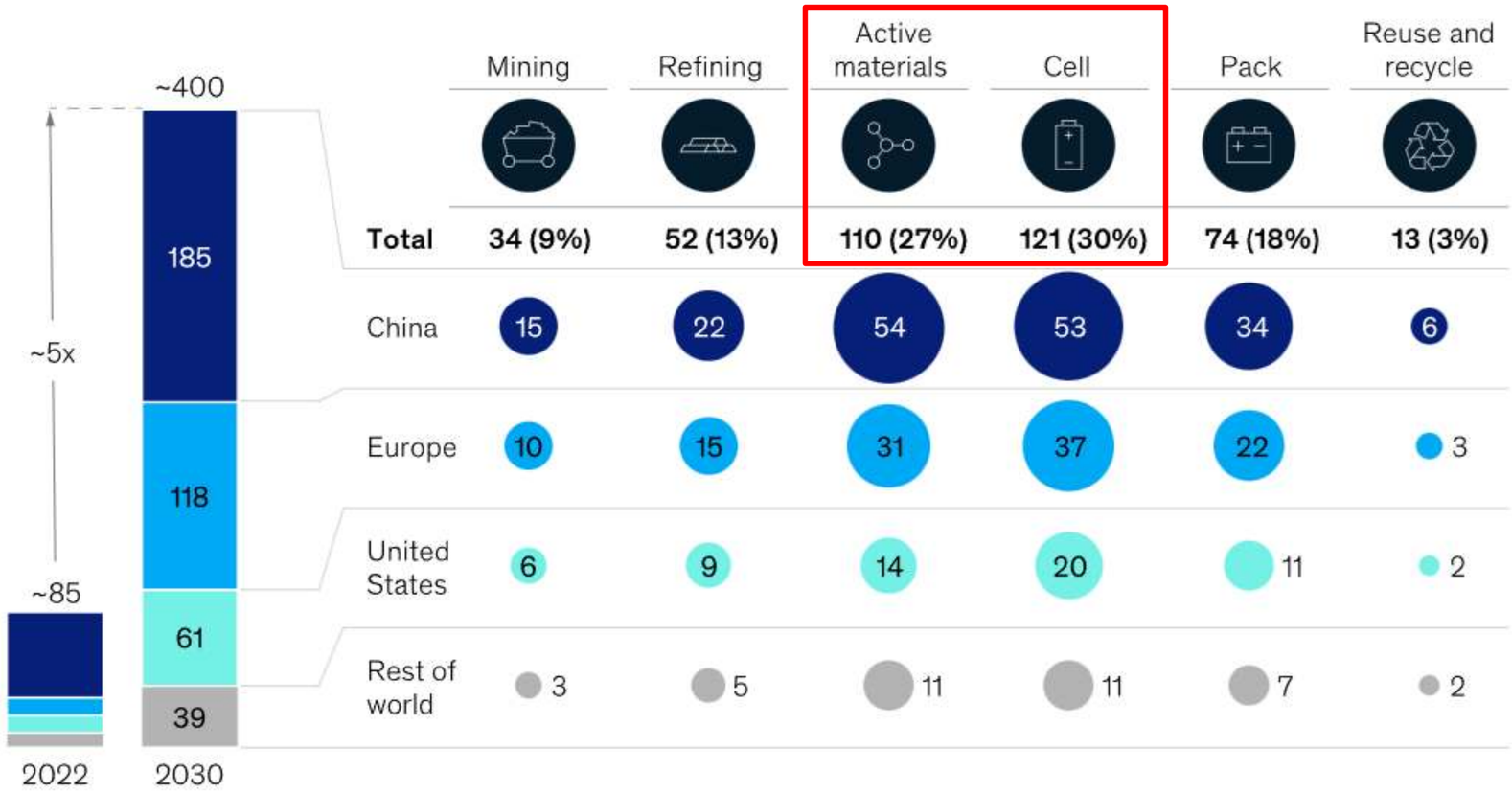
Li-ion battery demand is expected to grow 27% annually

Expected revenue over entire value chain is over $400 bln by 2030

Global Li-ion battery cell demand, GWh, Base case



Revenues, base case 2030, $ billion



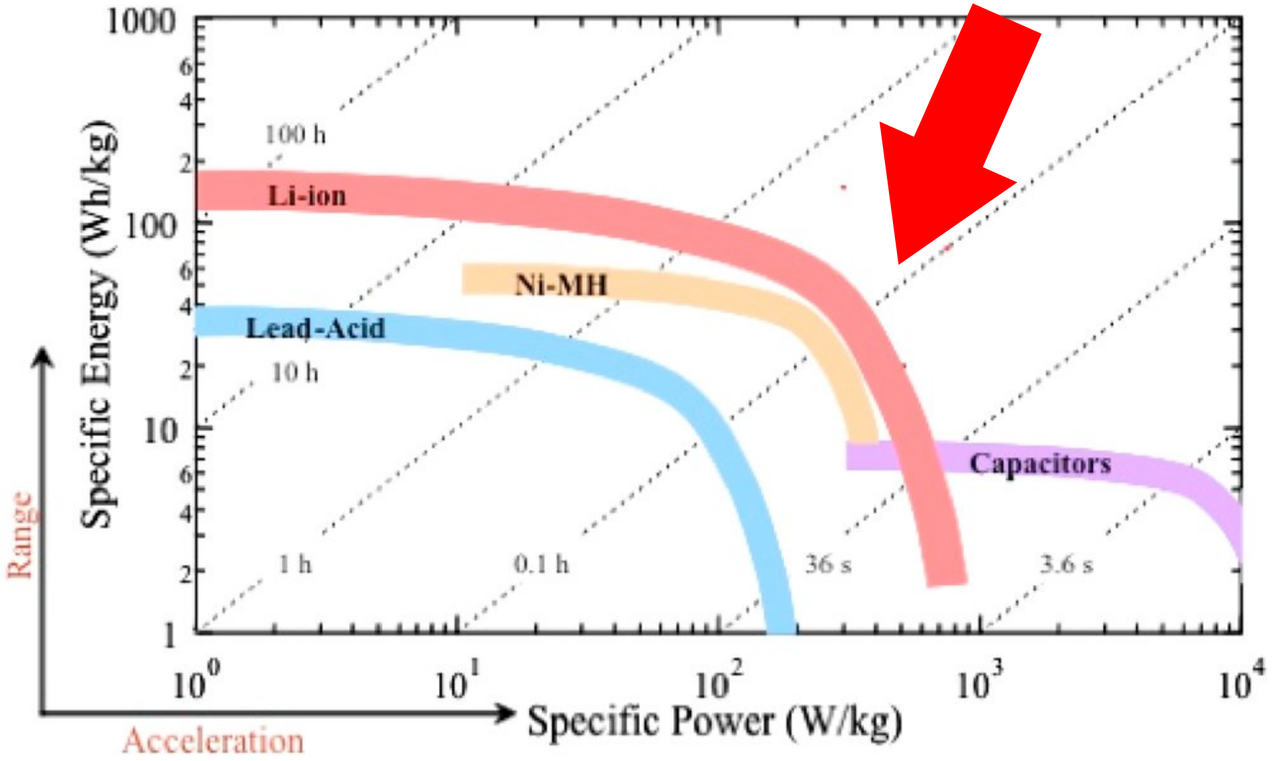
Dynamic market growth

Active materials and cells deliver the highest revenue in the LIBs value chain

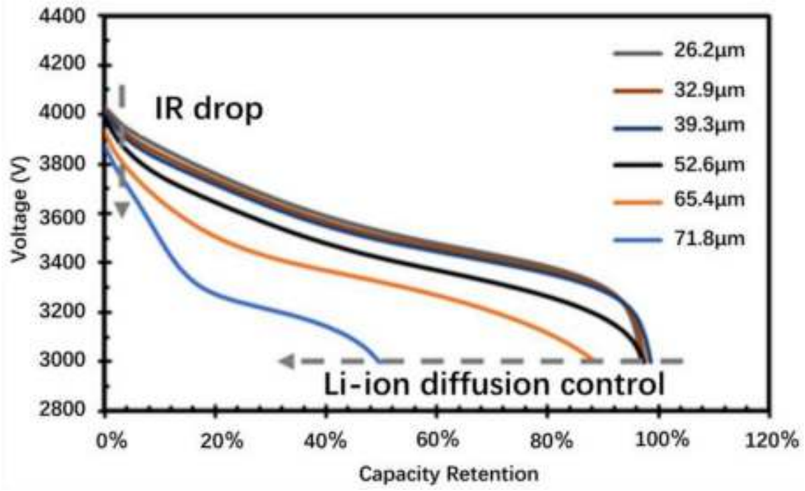
www.mckinsey.com

Two greatest challenges of LIBs: fast operation and high energy content

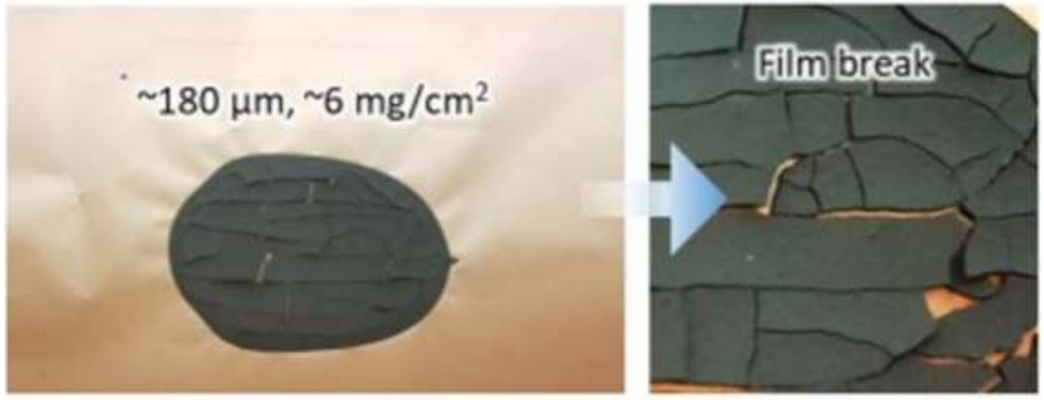
Charge/discharge within ~6 minutes – results in zero capacity



Thicker films (more energy) – performance ”penalty”

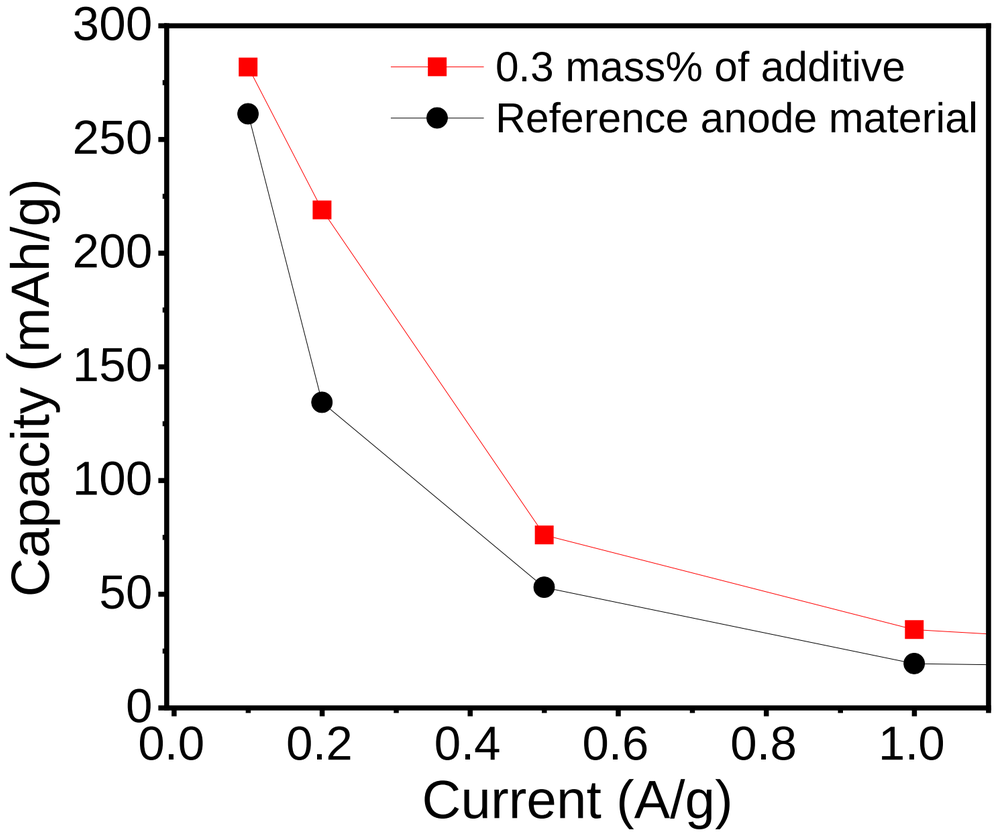


Thicker films (more energy) - low mechanical stability



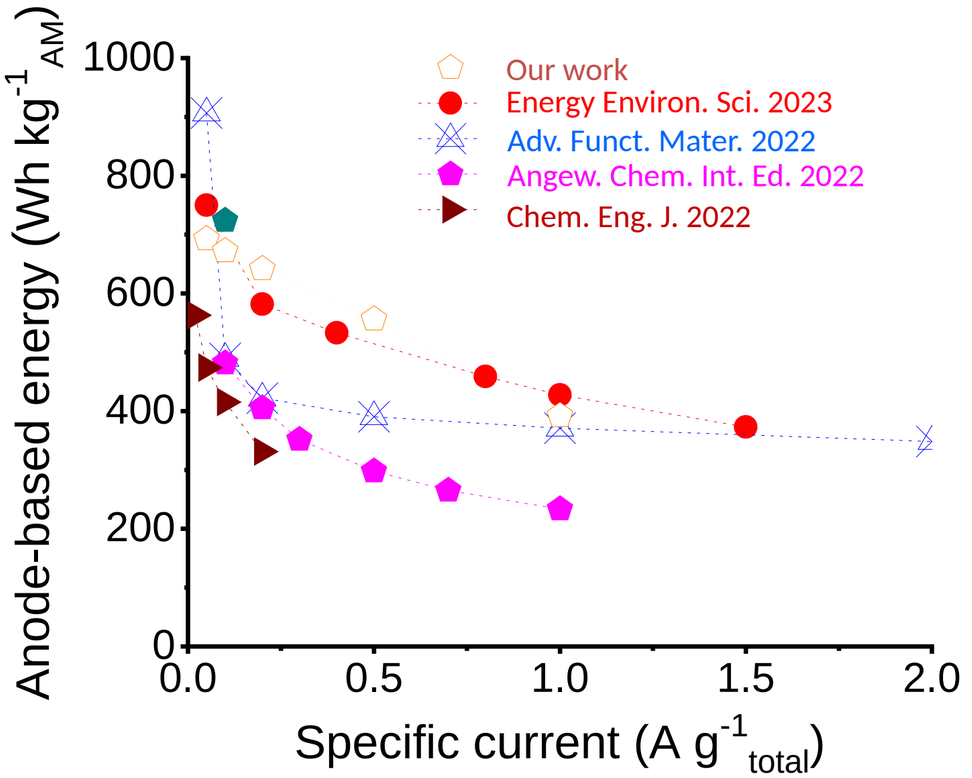
The ion/electron-conducting additive improves rate performance of anodes for Li-ion and K-ion batteries

Li-ion battery (anode test in half-cell vs Li)



Industrially-relevant anode composition and thickness
(95% AM content, ~5.5 mg/cm2)

K-ion battery (anode test in half-cell vs K)



The product description

The proposed product is an ion/electron-conducting additive for anodes and cathodes of LIBs, and emerging Na- and K-ion batteries.

Details:

1. The material improves both ionic and electron conductivity of cathodes and anodes of alkali metal-ion batteries and anodes of alkali metal-ion capacitors.
2. It is applicable as a 0.2 - 1.0 mass % component to standard electrode material slurries (anodes and cathodes) in standard electrode preparation processes (both wet and dry-processing).

Unfair advantages of our electrode material additive

1. 50% improvement of graphite anode rate performance in LIBs.
2. Graphite LIBs anode capacity increase by ~5%.
3. The highest energy content among research-grade K-ion anodes.
4. Technologically compatible with industrial workflow for anodes and cathodes preparation.
5. Improves anodes and cathodes of alkali metal-ion materials.
6. The material is a know-how of our team.

Defined customers and market

Who are our customers

Our customers are the lower tier of the battery industry. They are, for example, electrode manufacturers, or R&D centres or R&D centres of the battery industry.

For which market is the product intended

Early adopters, battery manufacturers.

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THANK YOU

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Comparison with industrially-compatible anode materials for K-ion batteries

Properties	Our material	Graphite	Hard carbon
Energy	High	Moderate	Moderate
Power	High	Low	Moderate
Toxicity	Non-toxic	Non-toxic	Non-toxic
Volume expansion	Low	60%	10%
Solvent	Water/NMP	Water	Water

Comparison with industrially-compatible anode materials for Li-ion batteries

Properties	Our material	Graphite	Hard carbon	Research-grade carbon materials
Energy	High	High	Moderate	High
Power	High	Low	Moderate	High
Toxicity	Non-toxic	Non-toxic	Non-toxic	n.a.
Solvent	Water/NMP	Water	Water	NMP or water
Binder	None	CMC-SBR	CMC-SBR	PVDF or CMC-SBR
AM content	100%	~95%	n.a.	80-90%