



UNIVERSITAT DE
BARCELONA

PhD student opening report



Next Generation Batteries based on Sulfur Cathodes

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Research Novelty

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Research Background

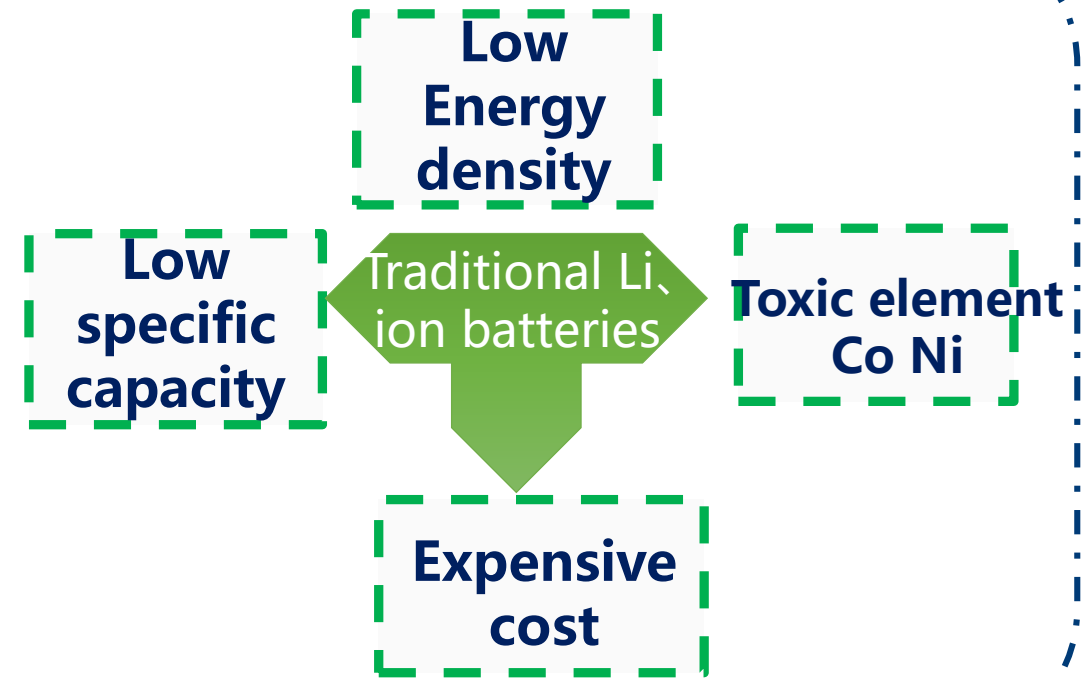
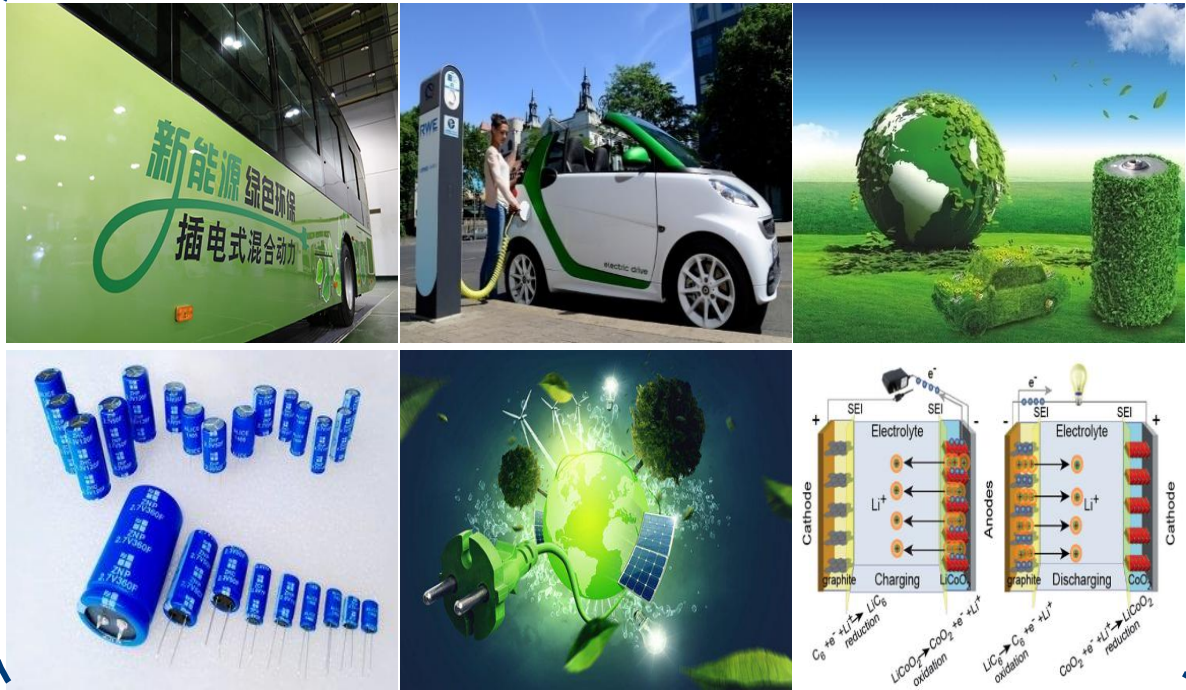


Scientific Problem
Environment pollution and
Energy resources depletion



New energy and Environmental
friendly: Solar Wind Tidal Energy

Research Background

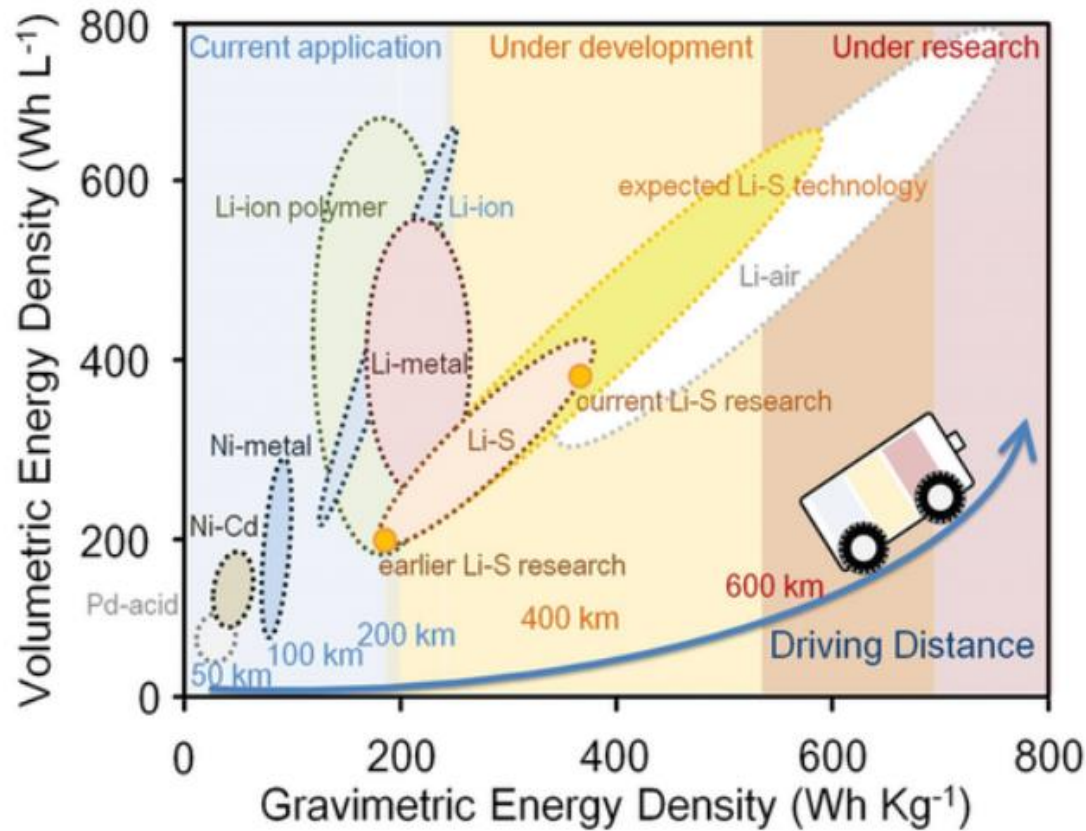


Scientific Problem

How to improve energy density and more environment friendly?

Research Background

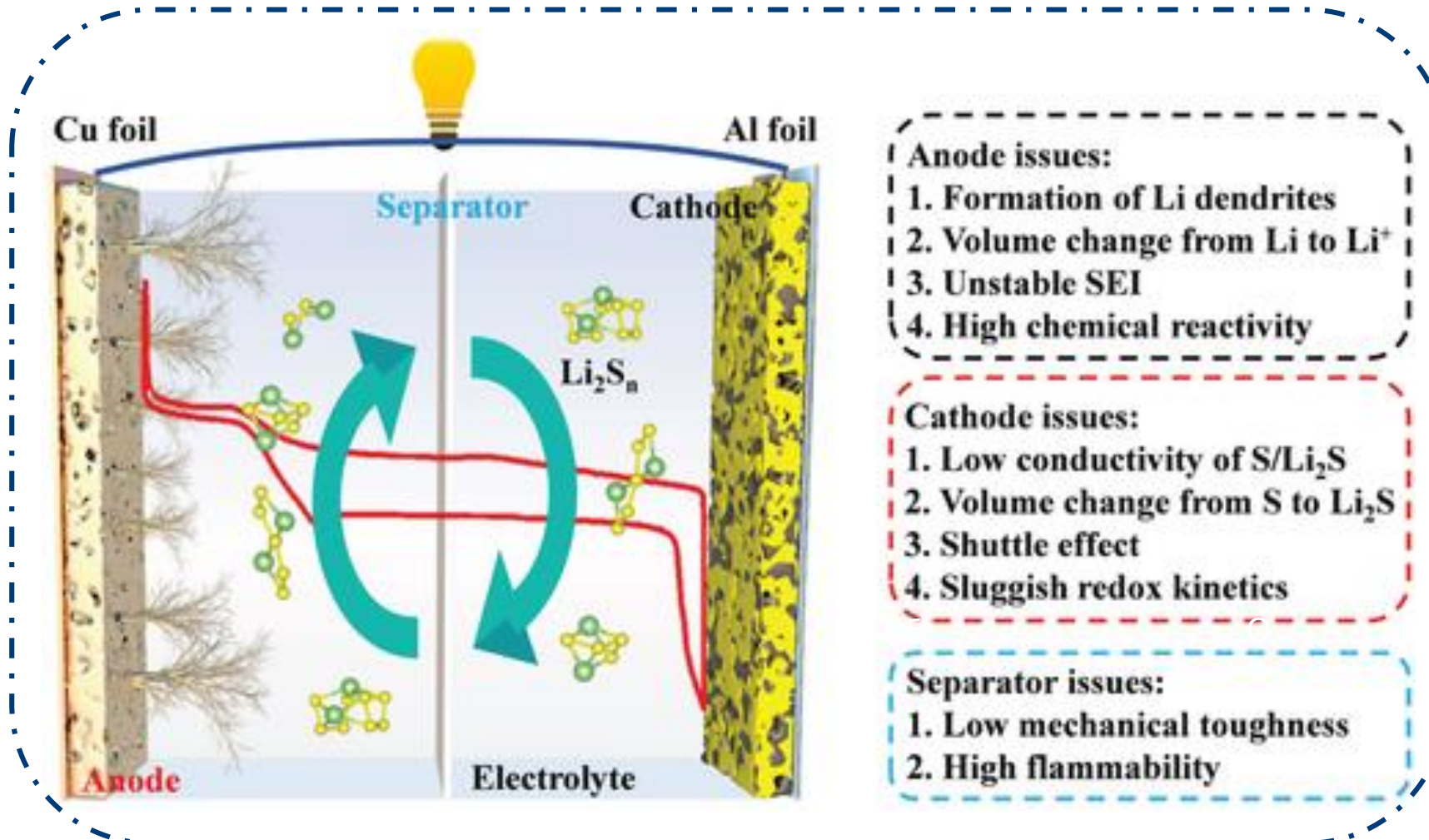
Sulfur as the most promising cathode



- ◆ High energy density
(2600 Wh kg^{-1} and 2800 Wh L^{-1})
- ◆ High specific capacity
(1675 mA h g^{-1})
- ◆ Low cost
- ◆ Easy and cost effective to recycle than LIBs

Research Background

challenges



What should we do?

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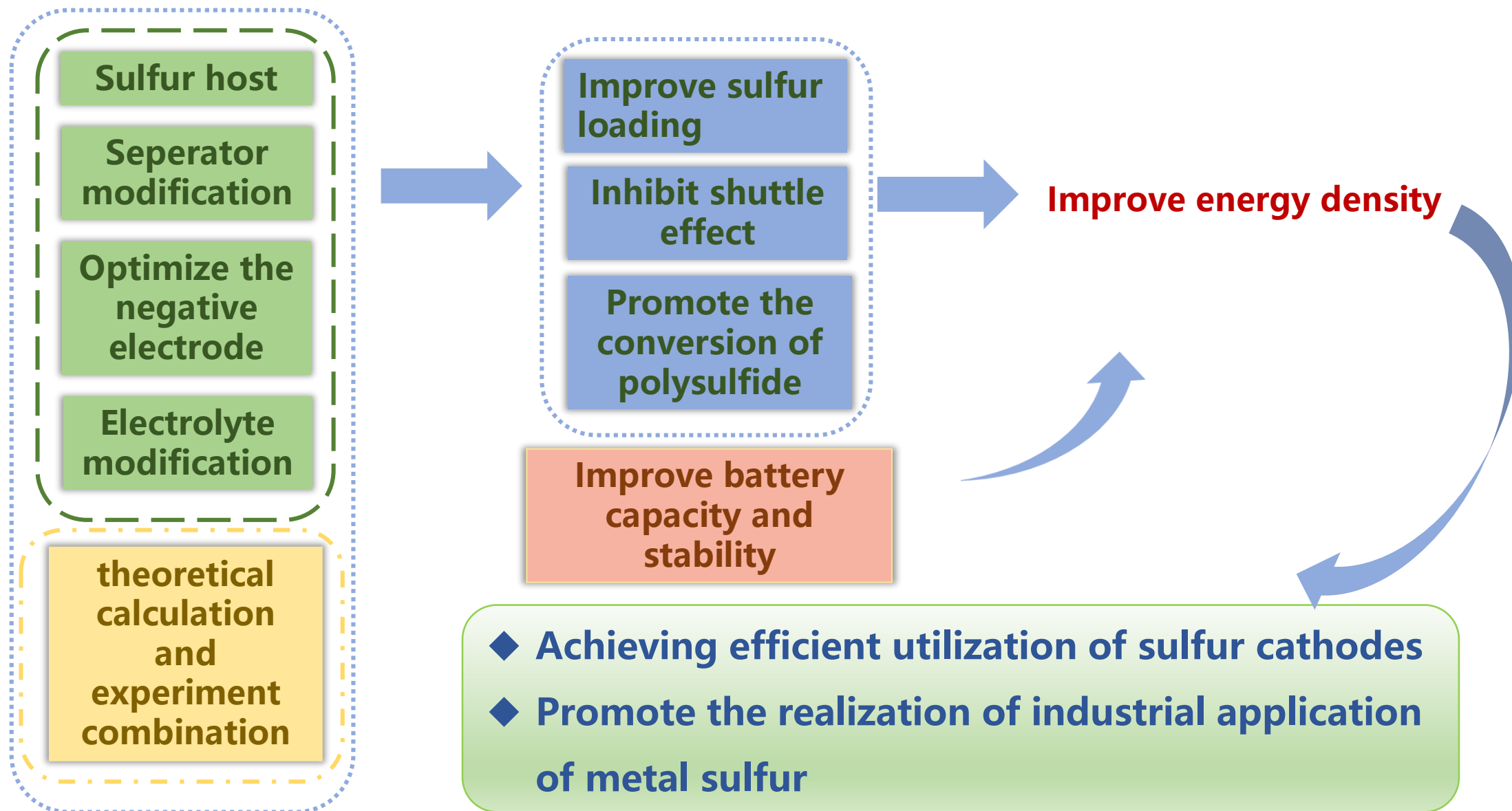
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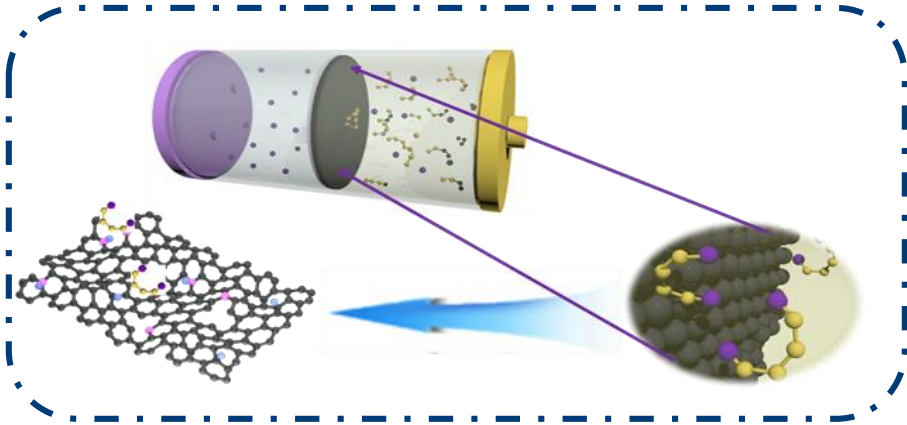
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Research Novelty

Research Plan



Research Plan



Research Objectives

- ◆ Improve the utilization of sulfur cathode

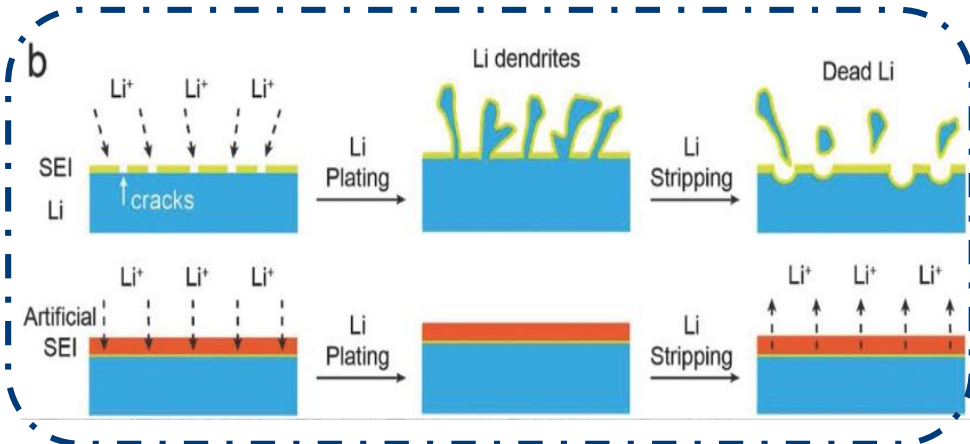
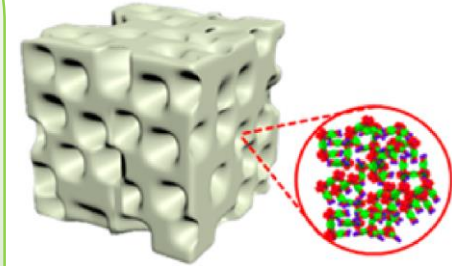
1. Hierarchical Porous Carbon
2. Introduce catalyst

- ◆ Functional membrane physical and chemical adsorption

- ◆ Modified metal anode interface coating
 1. Introduce the interface coating

2. Alloying improves stability

- ◆ High concentration electrolyte



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- ◆ Combining DFT to screen sulfur-host materials with efficient catalytic performance and good electrical conductivity for improved long-cycle performance.
- ◆ Designing 3D porous carbon materials to improve the performance of carbon materials by doping heteroatoms, the purpose is to improve the conductivity of sulfur, increase the sulfur loading, and make the electrolyte better infiltration.
- ◆ And on this basis, in-situ growth catalysts are carried out to improve the conversion of polysulfide and reduce the shuttle effect.

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Research Novelty

For lab research

◆ batteries based on Sulphur cathodes have real potential for commercialization with performances beyond those of LIBs and additional advantages in terms of cost, sustainability, toxicity and environmental friendliness.

For Industrial application

◆ the demonstration of their potential and their successful commercialization relies on the optimization of the different components and their proper assembly.

Thanks for Your Attention!

