

PLANET HACK 2025

Renewable Energy Storage technologies



Australian
National
University

1 Renewable energy

Energy Transition

- **Environmental Reasons**

Air pollution, global warming, extreme weather events, ecological sustainability

- **Energy Security & Economic Requirement**

Fossil fuel limited reserves, overexploitation leads to depletion, non-renewable, energy supply independence & price stability

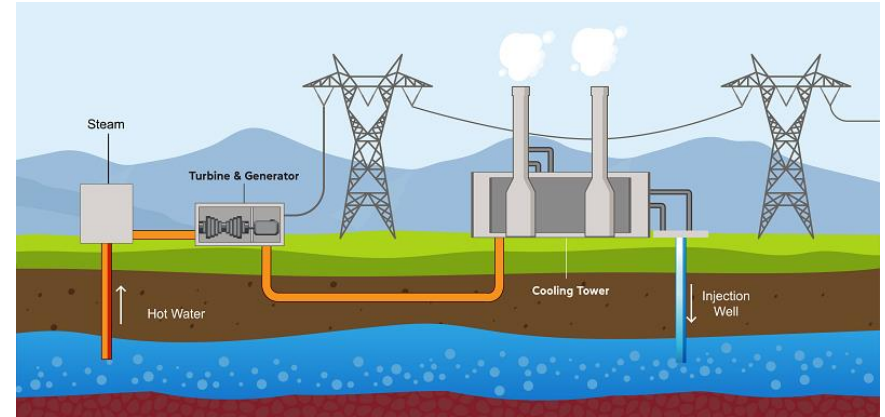
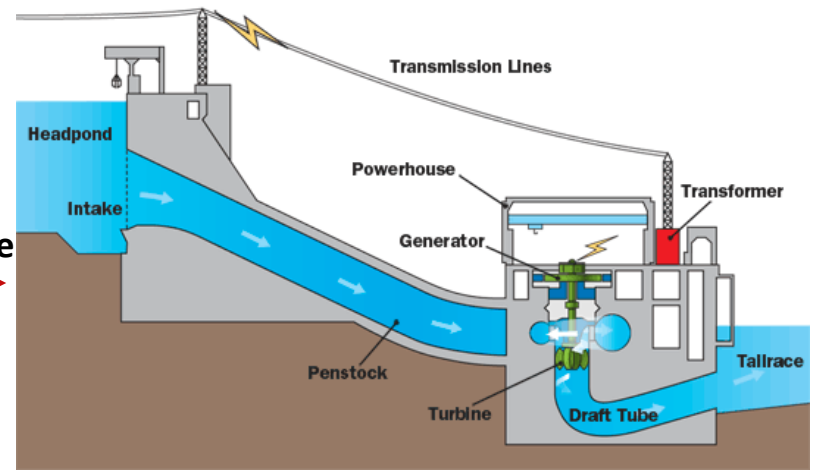
- **Technology & Social Progress**

Promote technology innovation, enhance living conditions, Global climate responsibility,



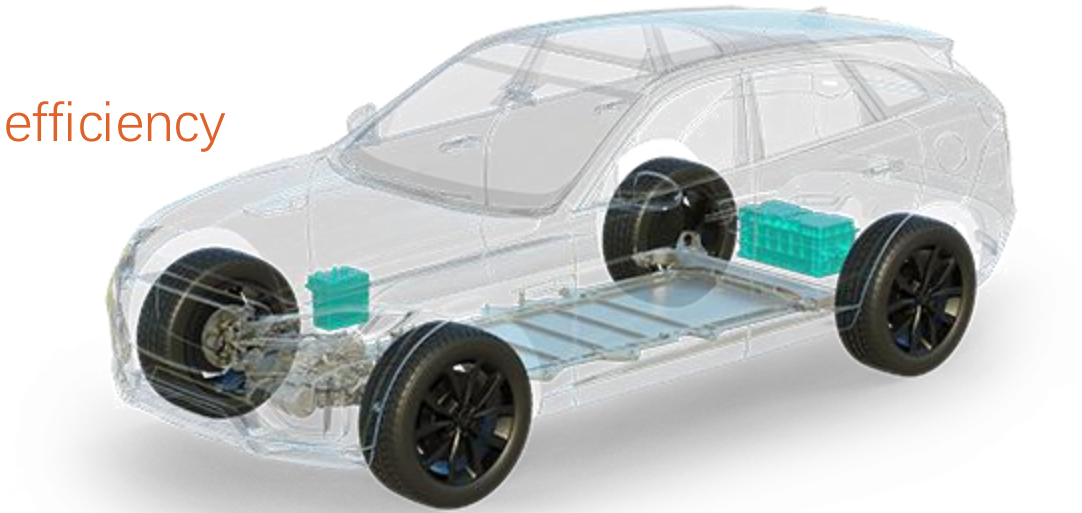


Work principle
→



2 Energy storage

- Mismatch between energy supply and demand
- Grid stability
- Improve energy utilization efficiency
- Support energy transition



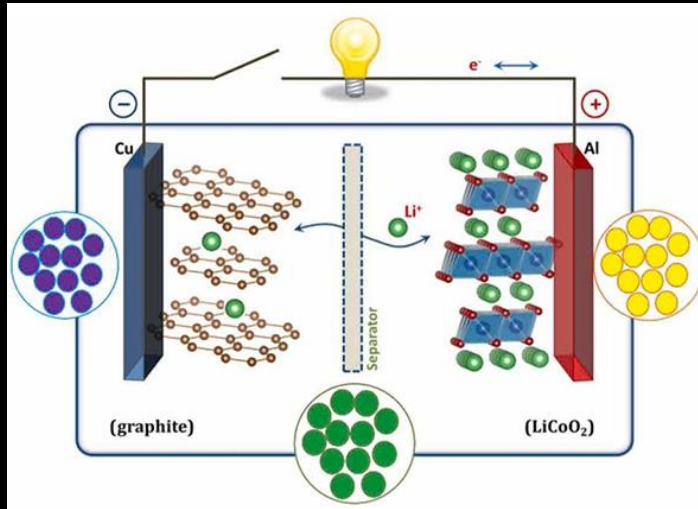
2.1 Chemical energy storage-rechargeable batteries

- Lithium-ion batteries (锂离子电池)
- Lithium-sulfur batteries (锂硫电池)
- Sodium-ion/potassium-ion batteries (钠离子/钾离子电池)
- Ca^{2+} , Mg^{2+} , Al^{3+} ion batteries (钙/镁/铝离子电池)
- Aqueous proton batteries (水系质子电池)
- All solid-state batteries (全固态电池)

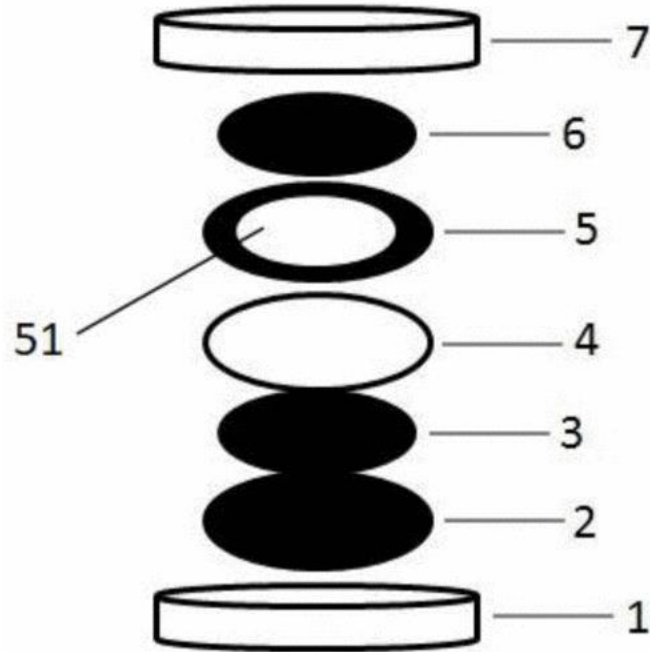


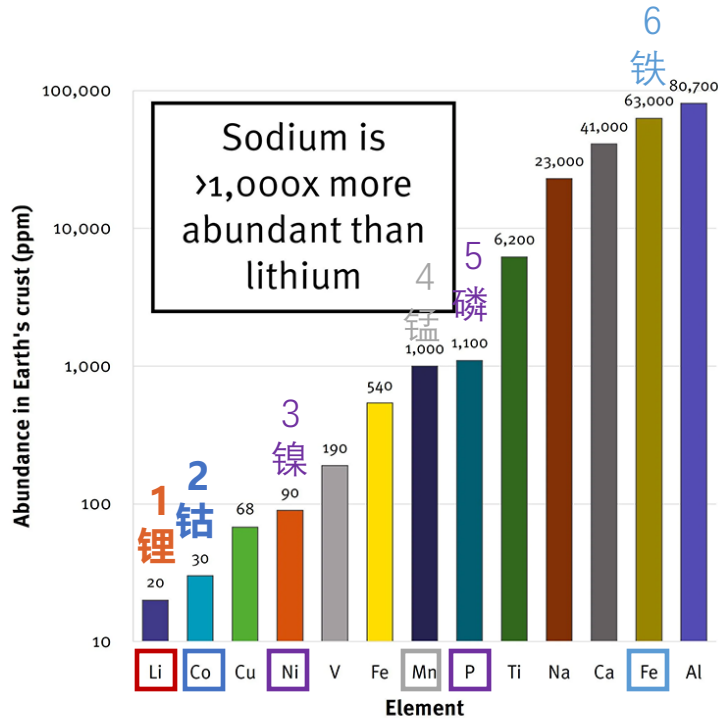
2.1 Chemical energy storage-rechargeable batteries

- Lithium-ion battery

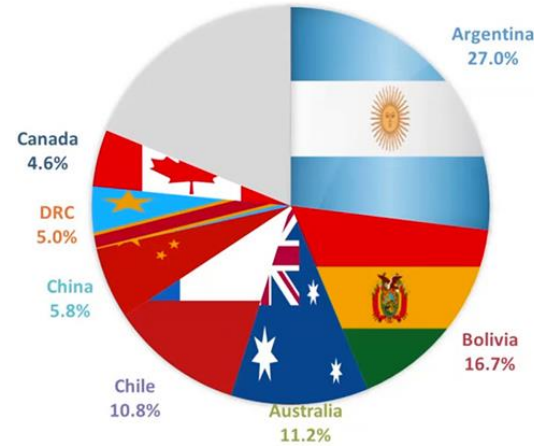


Structure diagram of coin cell for laboratory research





*Note – Abundance varies with different locations



Argentina and Bolivia account for 43.7% of global lithium resources

The top 7 countries account for 81.2% of global lithium Resources

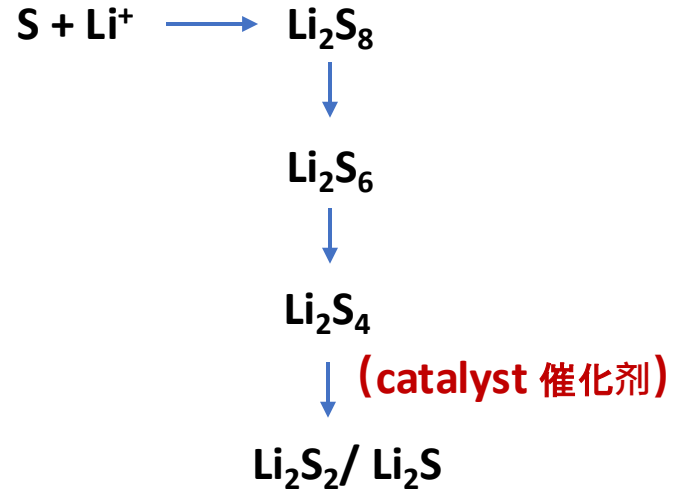
Global distribution of lithium resources by country

Abundance comparison of element in the crust





- Lithium-sulfur battery



Periodic table of elements

1. Energy density (Wh/kg)
2. Theoretical specific capacity (mAh/g)
3. Discharging voltage (V)
4. Ion radius (nm)
5. Positive charge numbers
6. Electrolyte: organic/water based
7. Advantages/disadvantages
8. Application prospects
9. Raw material price
10. Safety concerns
11. Environment

	H 氢	H ⁺ (H ₃ O ⁺) Proton battery		
Li ⁺	Li 锂			
Na ⁺	Na 钠	Mg 镁	Mg ²⁺	Al 铝
K ⁺	K 钾	Ca 钙	Ca ²⁺	Al ³⁺

2.2 Energy conversion

- Carbon capture

- Carbon dioxide reduction:

Green house gas CO_2

CO

CH_4

CH_3OH

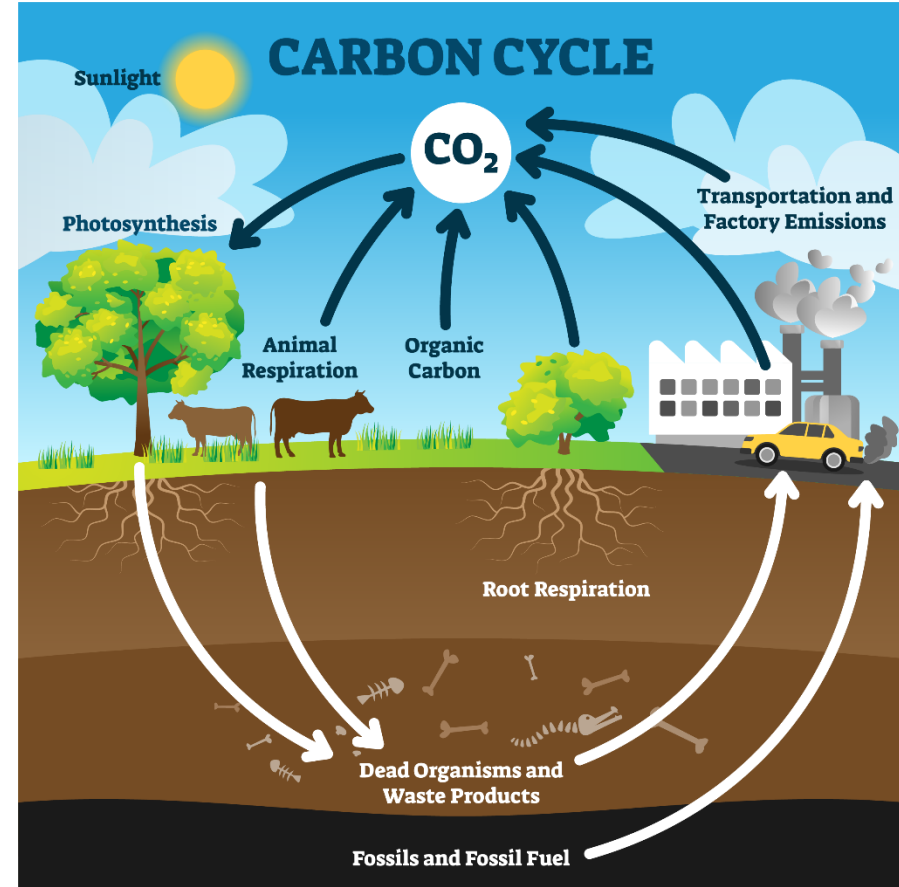
- Water splitting



Catalysis

Electrocatalysis

Photocatalysis :





Thank you



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