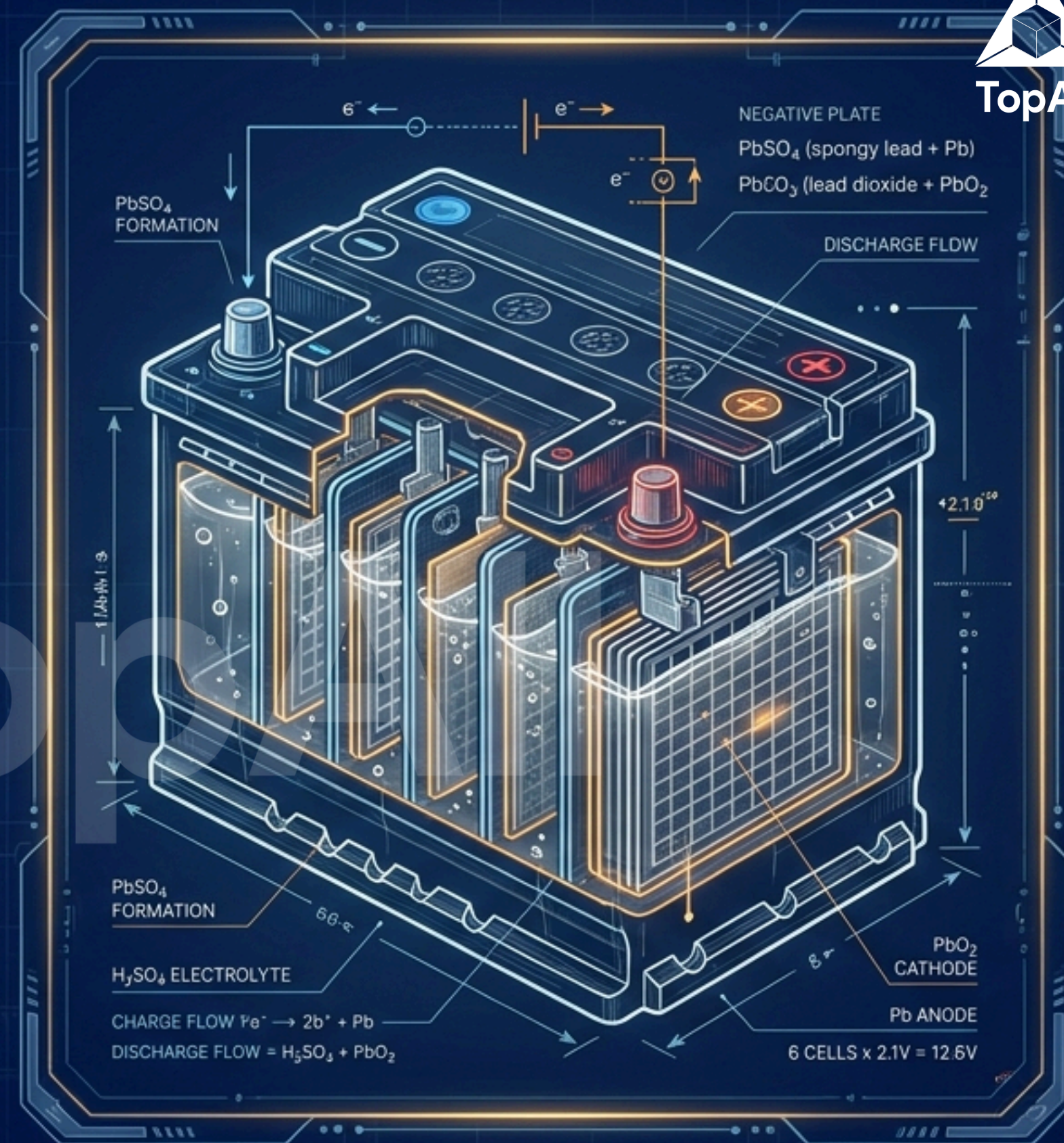


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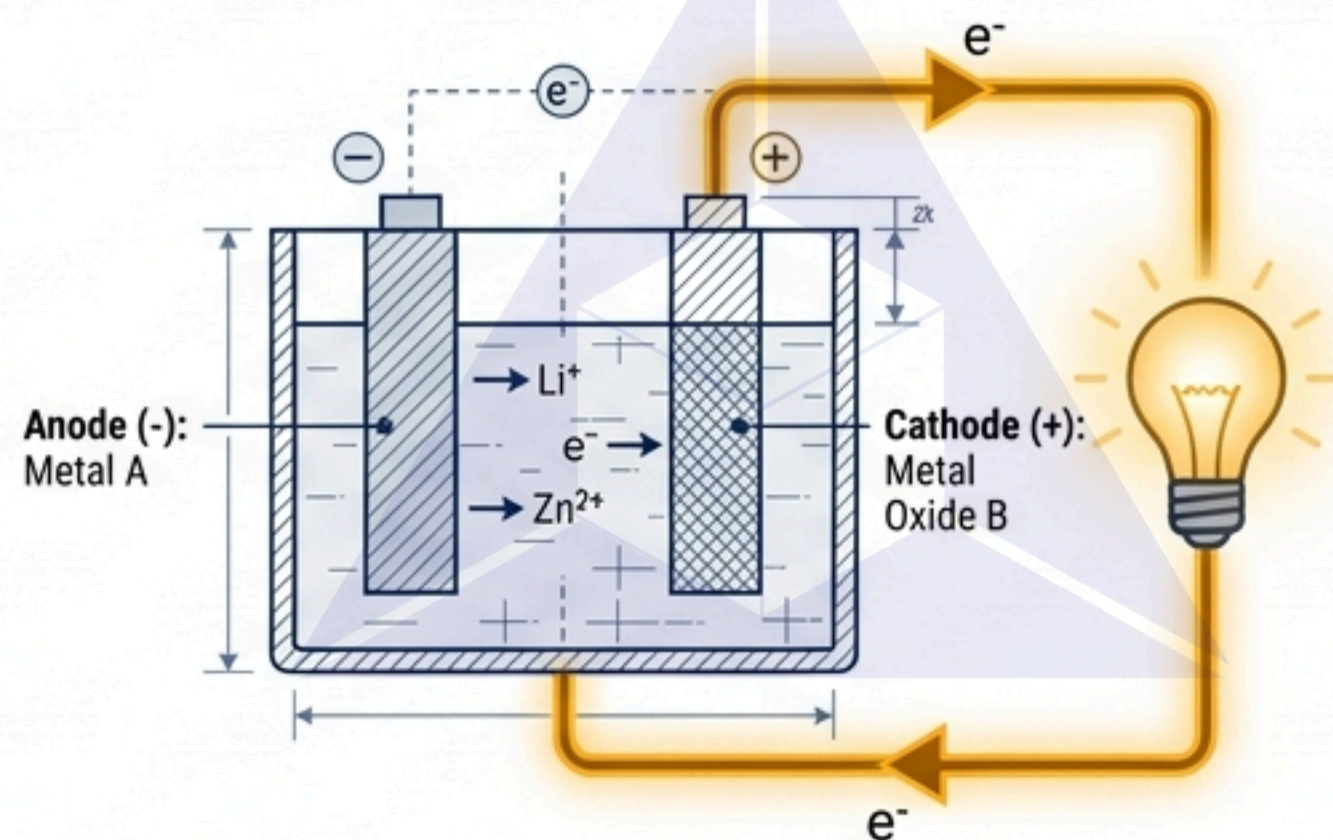
Lead Storage & Nickel-Cadmium Batteries

The Reversible Chemical Engine



The Rechargeable Cell

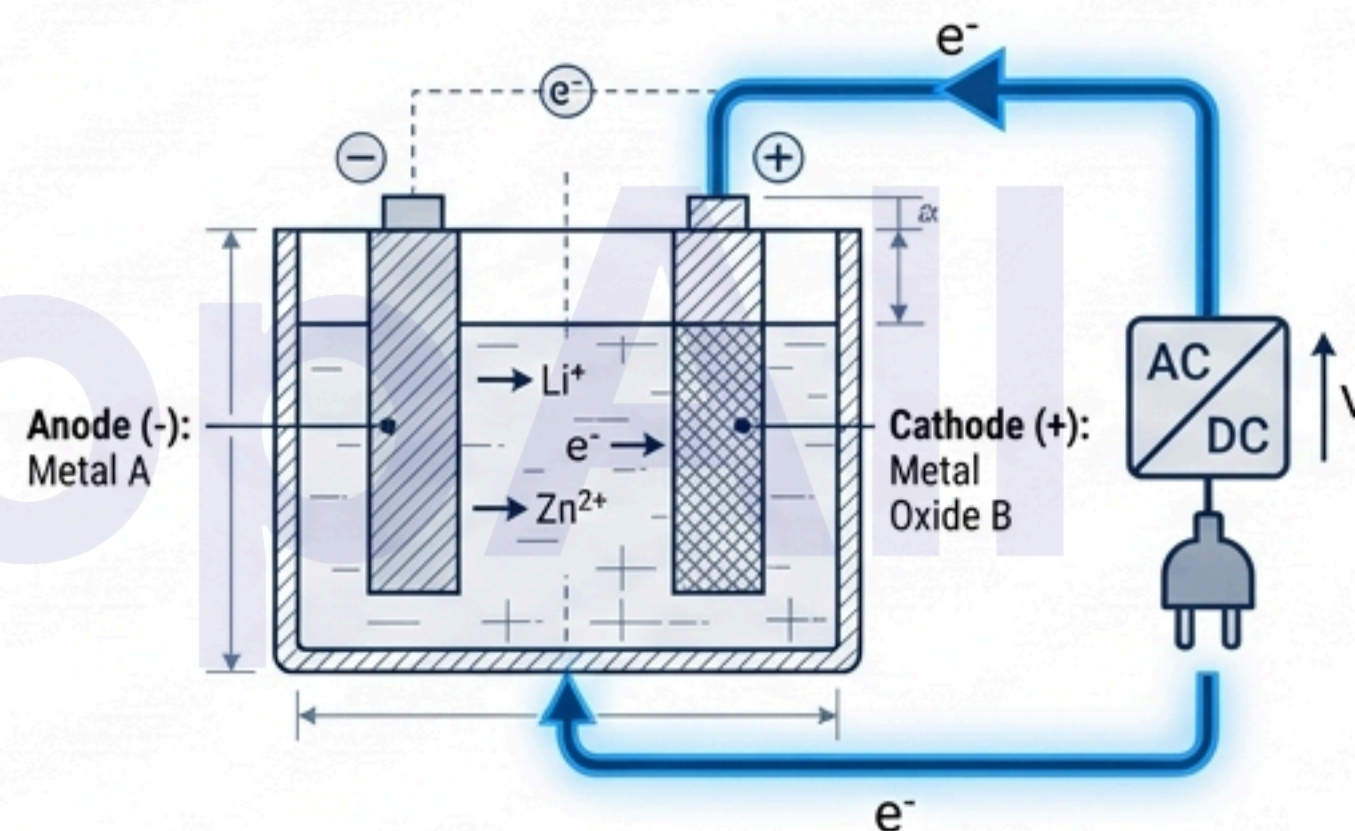
DISCHARGE



Spontaneous reaction $\rightarrow$ Electricity Produced.

The system acts as a standard Galvanic Cell.

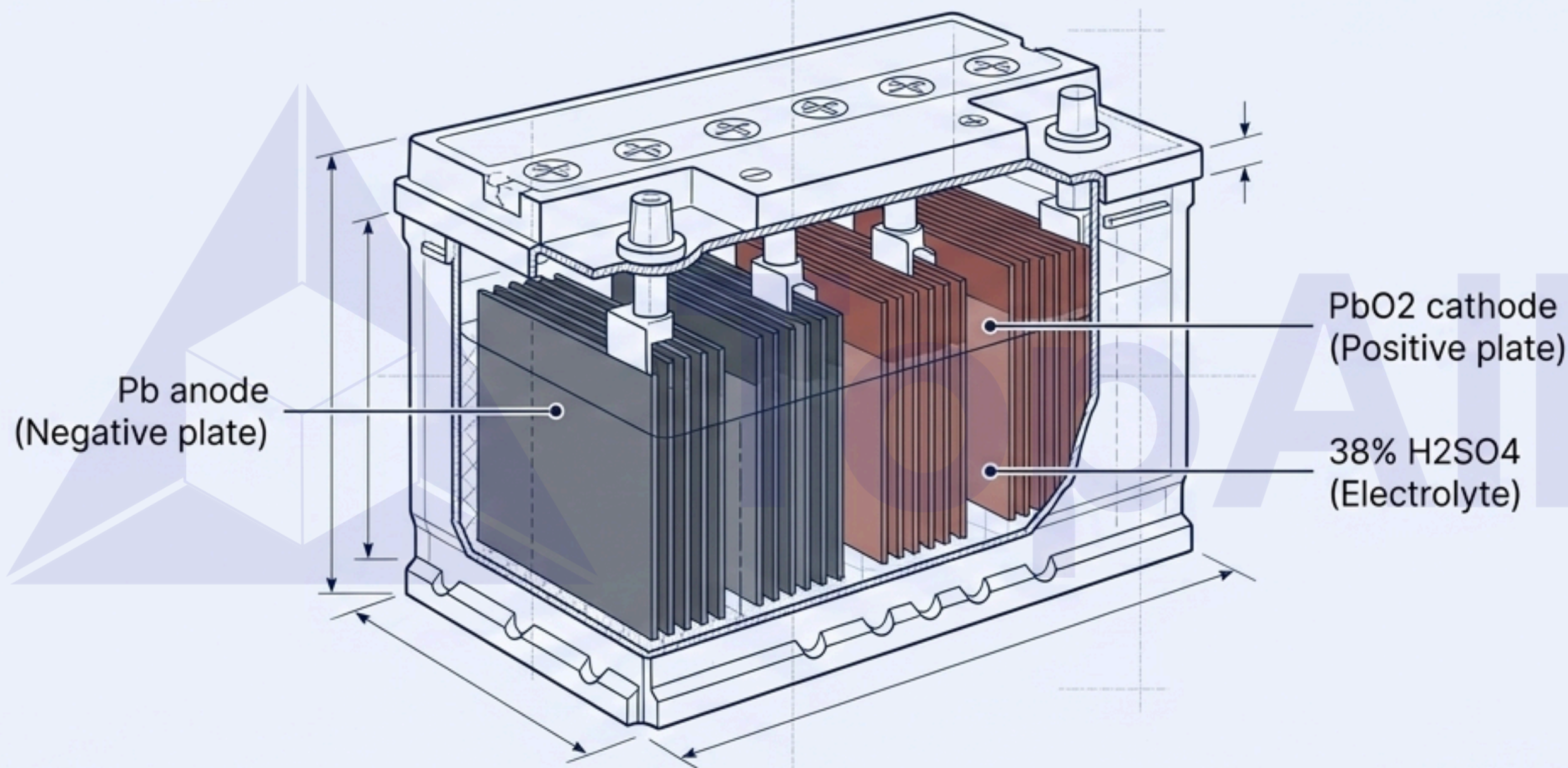
CHARGE



Non-spontaneous $\rightarrow$ Reaction Reversed via external voltage.

The system is forced backward, acting as an Electrolytic Cell.

Lead Battery Construction



This specific configuration is the standard power setup utilized globally in automobiles and home inverters.



You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



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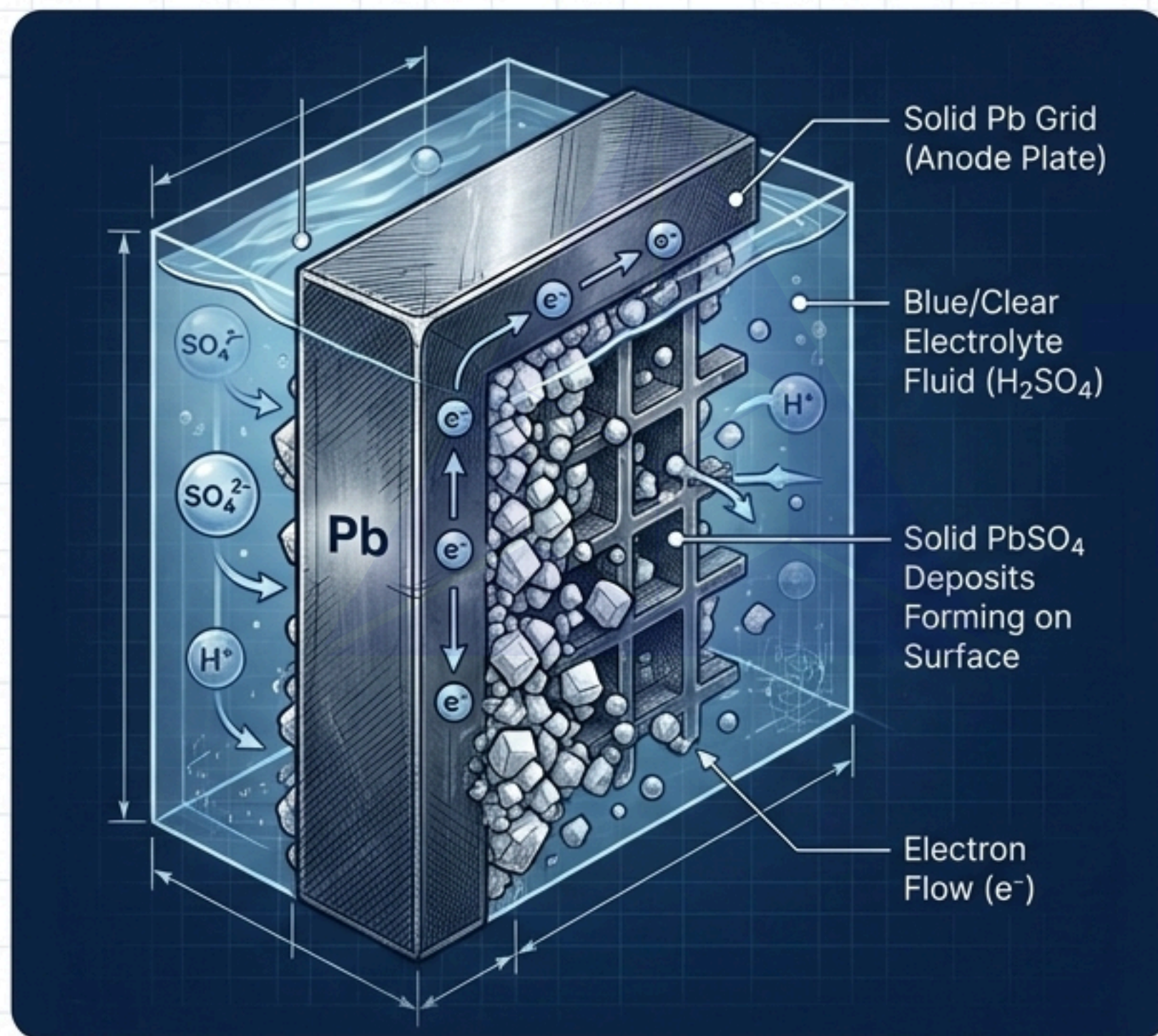
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Key Highlights

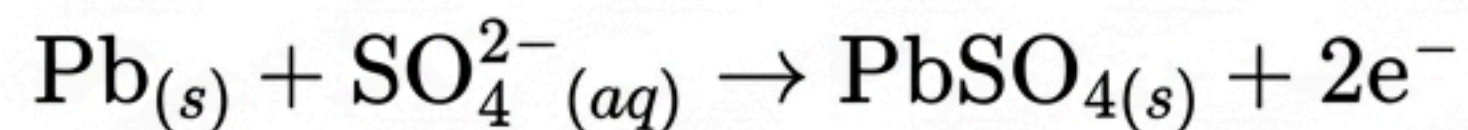
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Anode Reaction (Discharge)



ANODE REACTION

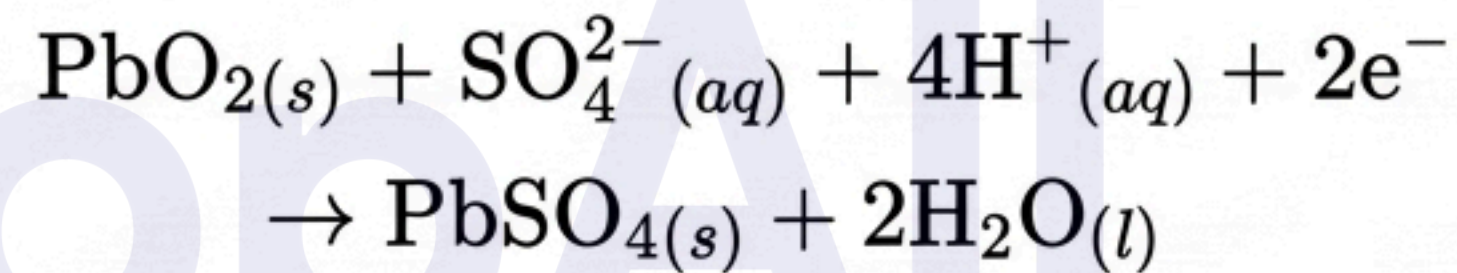
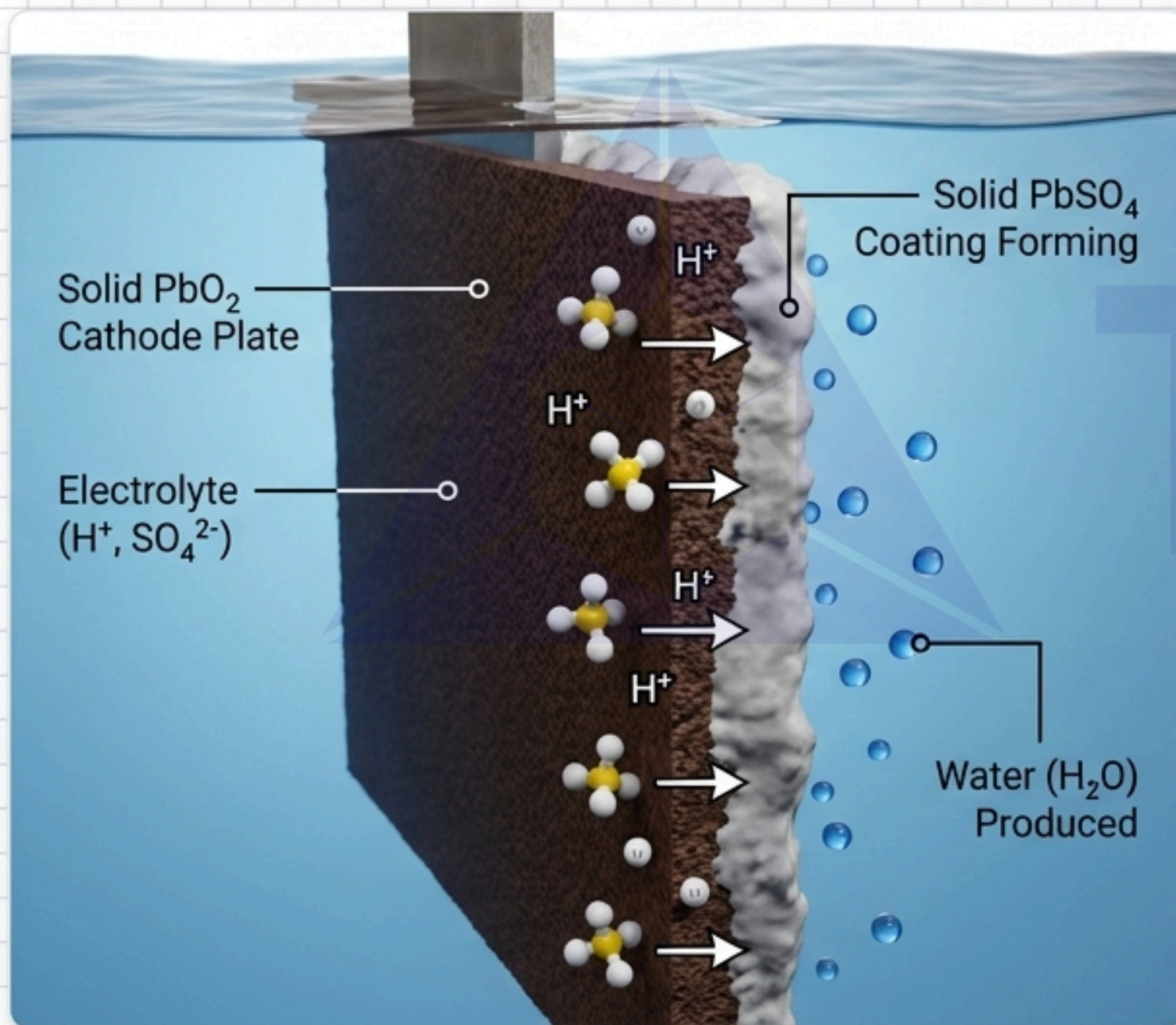


JEE TRAP CARD

Examiners test **state-changes** here. Do not assume the **metal** dissolves into solution.

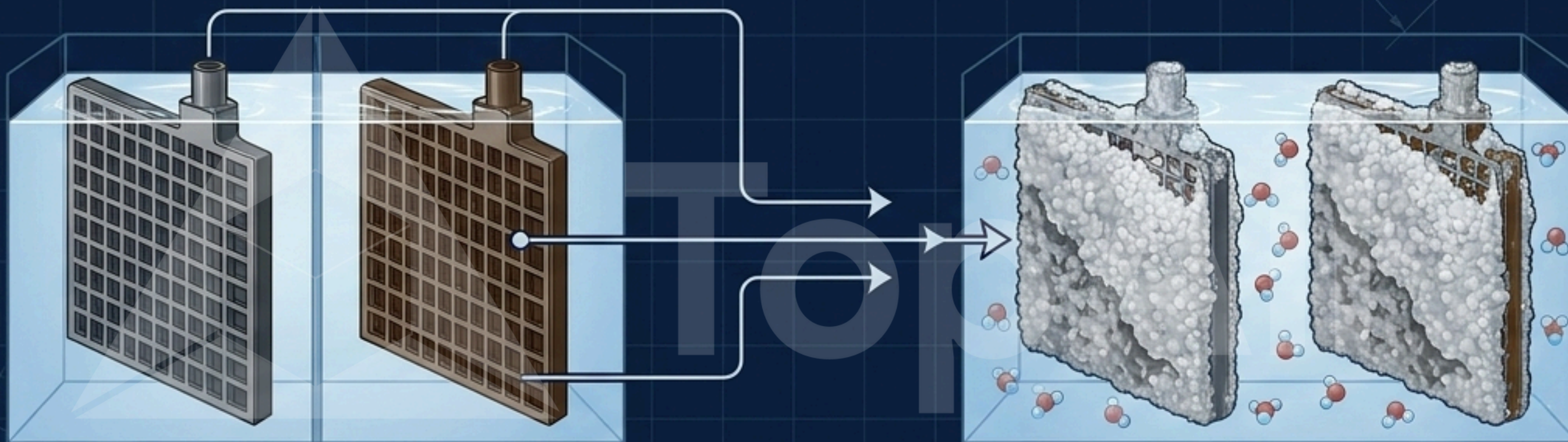
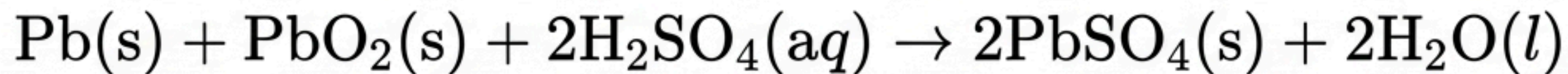
Solid Pb grid reacts to form **SOLID PbSO₄** which **intimately coats** the plate.

Cathode Reaction (Discharge)



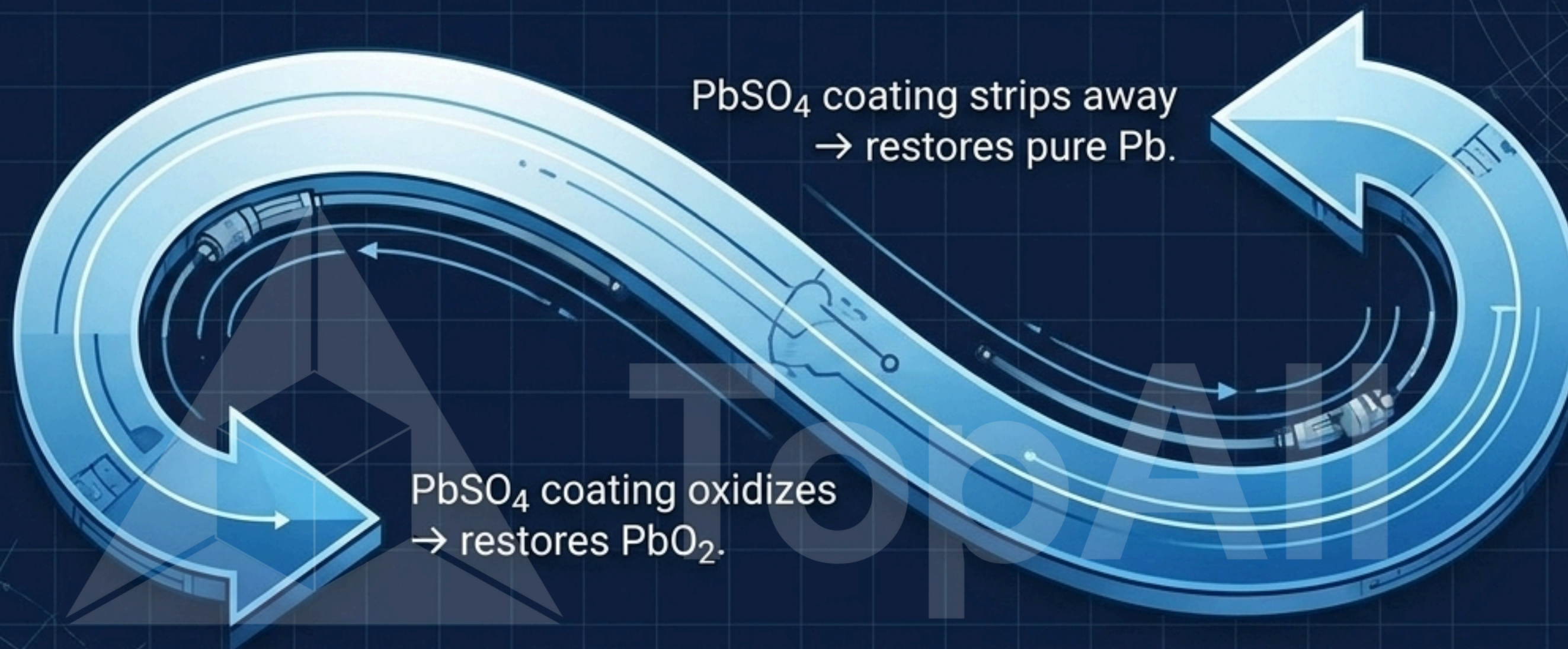
Notice the heavy consumption of 4H^+ ions. Acid (protons) is rapidly consumed to produce water during this phase.

Overall Discharge Convergence



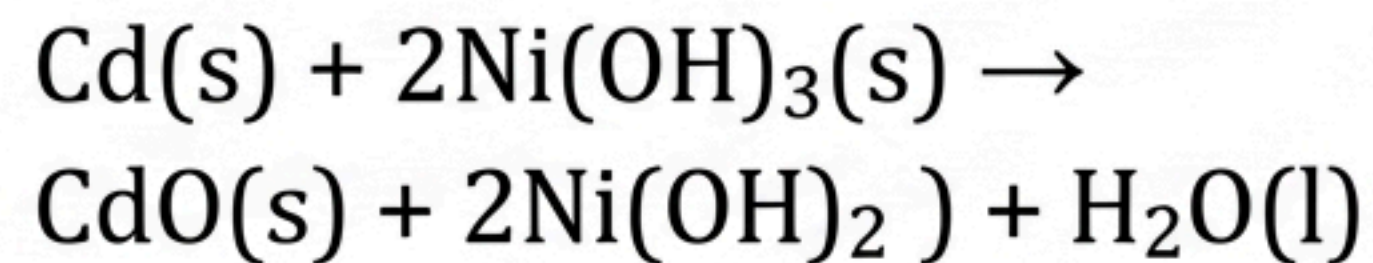
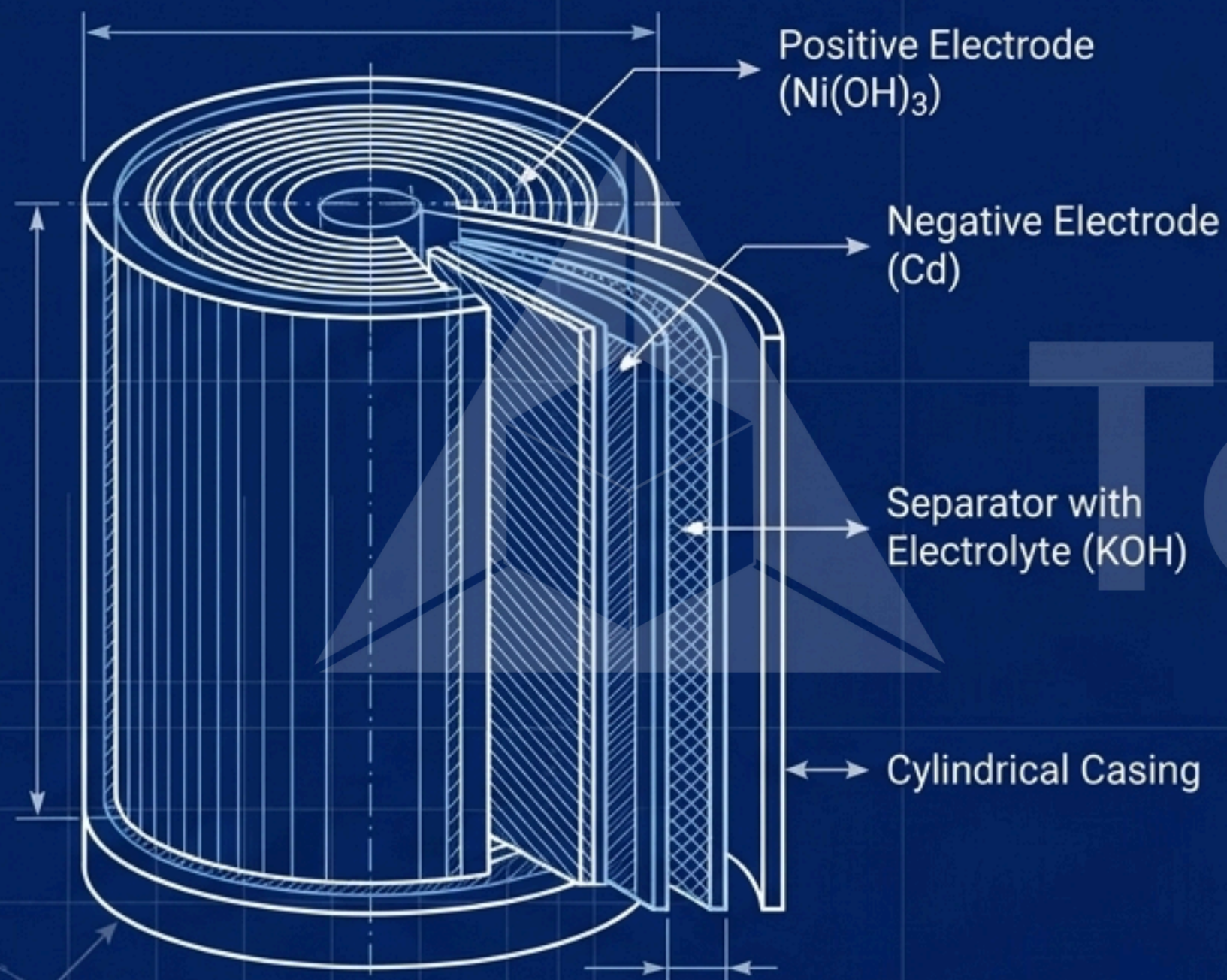
Because H_2SO_4 is consumed and water is produced, the density of the sulfuric acid electrolyte **DECREASES** as the battery discharges (a highly tested exam fact).

Charging: Reversing the Engine



Charging requires an external DC source. The system is now an **ELECTROLYTIC CELL**. The chemical reactions flip, meaning the anode/cathode sign conventions flip, even though the physical plates never moved.

The Nickel-Cadmium Alternative



Lead-Acid

- Cheaper to manufacture | Shorter operational lifespan.

Nickel-Cadmium (Ni-Cd)

- More expensive to manufacture | Significantly longer operational life.



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