

ELECTRODES

1. Advanced Definition

An electrode is a conductor through which electrons enter or leave an electrochemical system. It provides an interface for redox reactions between an electronic conductor (metal) and ionic conductor (electrolyte).

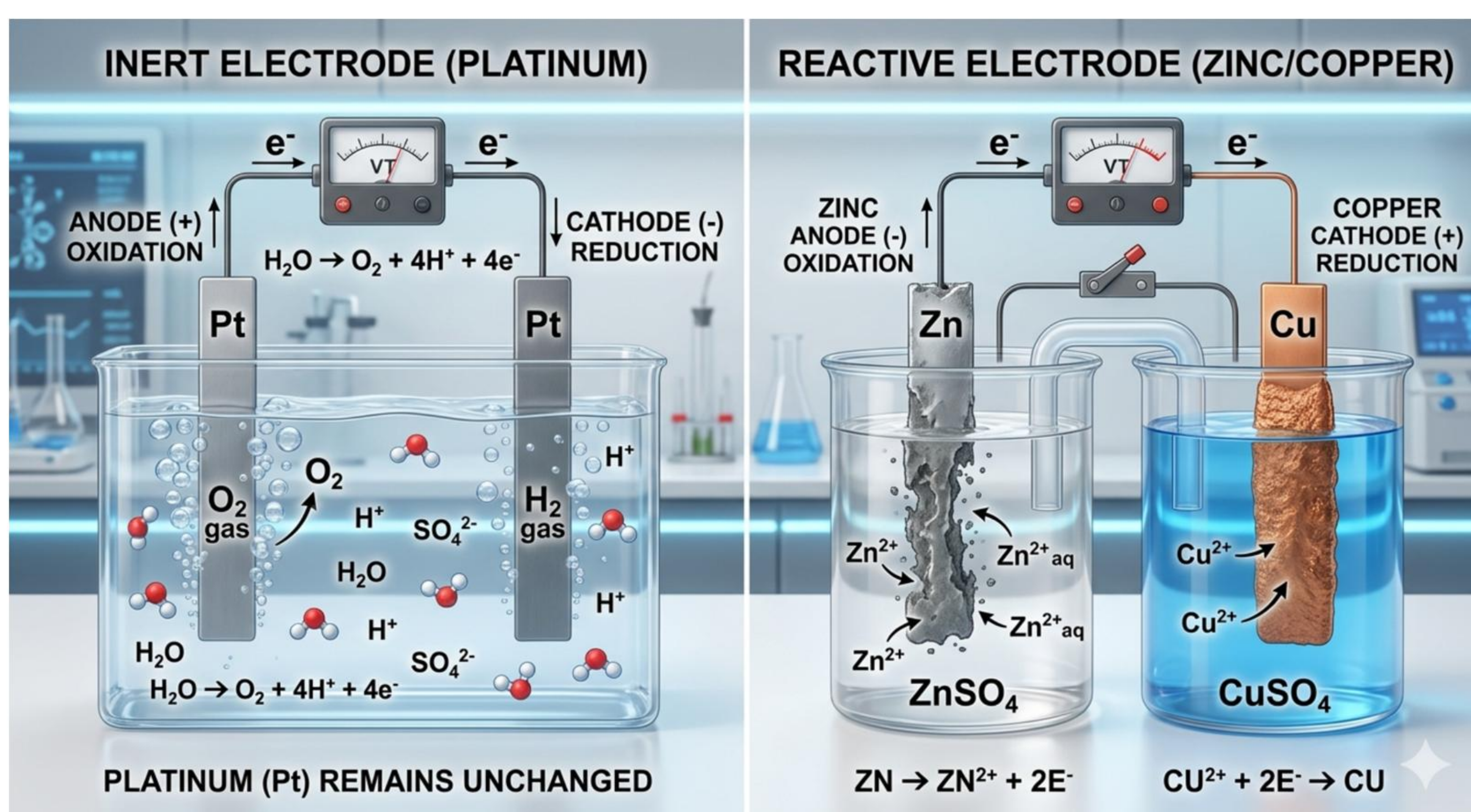
2. Types of Electrodes

Metal-Metal Ion Electrode: $\text{Cu} \mid \text{Cu}^{2+}$

Gas Electrode: Standard Hydrogen Electrode (SHE)

Inert Electrode: Platinum/Graphite

Redox Electrode: $\text{Fe}^{3+} / \text{Fe}^{2+}$



3. Electrode Potential

Electrode potential measures the tendency of an electrode to gain or lose electrons. Standard electrode potential (E°) is measured relative to SHE.

Nernst Equation: $E = E^\circ - (0.0591/n) \log Q$

4. Electrochemical Cells

Galvanic Cell: Chemical to Electrical (spontaneous)

Electrolytic Cell: Electrical to Chemical (non-spontaneous)

5. Anode vs Cathode

Anode: Oxidation (electron loss)

Cathode: Reduction (electron gain)

Galvanic: Anode (-), Cathode (+)

Electrolytic: Anode (+), Cathode (-)

6. Comparison Table

Feature	Anode	Cathode
Reaction	Oxidation	Reduction
Electron Flow	Releases electrons	Accepts electrons
Sign (Galvanic)	-	+
Sign (Electrolytic)	+	-

