



SNS COLLEGE OF TECHNOLOGY
Coimbatore-35
An Autonomous Institution



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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF BIOMEDICAL ENGINEERING

19BMT202– BIOMEDICAL SENSORS AND MEASUREMENT

II Year / III Semester

Unit 3 – BIOPOTENTIAL ELECTRODES & CONFIGURATION

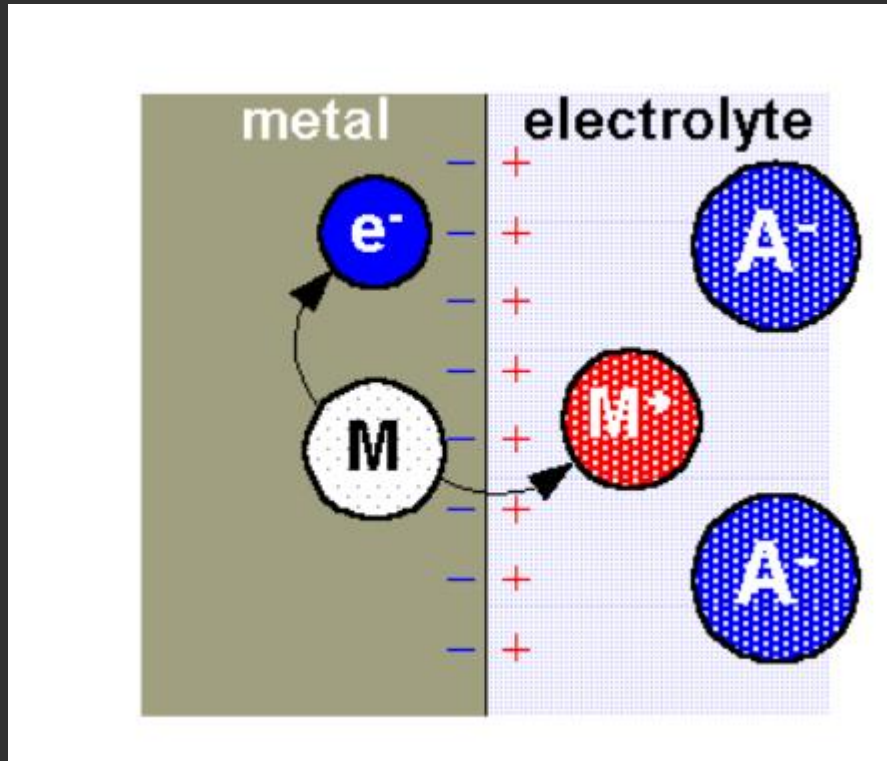
Topic :Half cell Potential

Welcome you all Design Thinkers to Today's Class



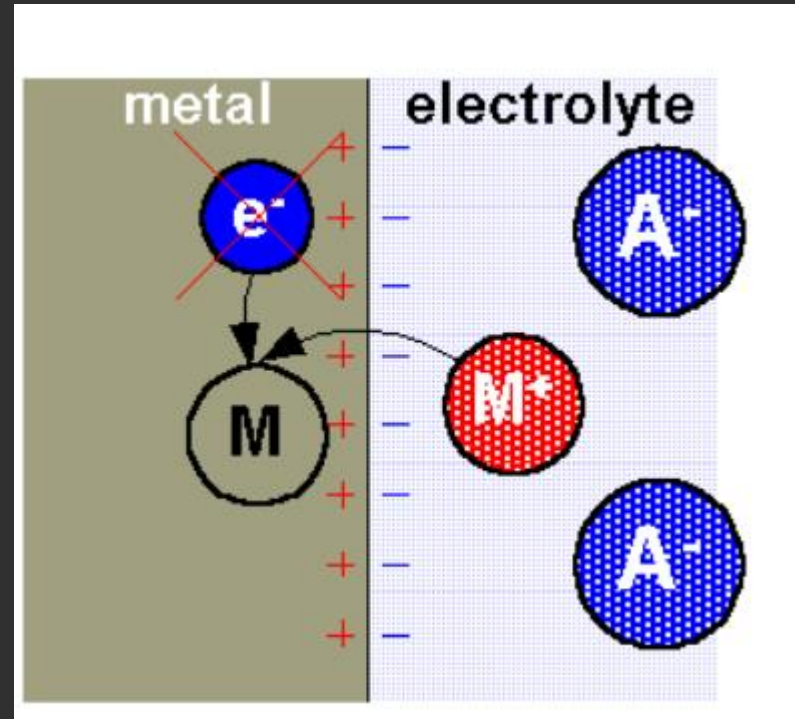
METAL CATION LEAVING INTO THE ELECTROLYTE

- One atom M out of the metal is oxidized to form one cation M^+ and giving off one free electron e^- to the metal.





METAL CATION JOINING THE METAL

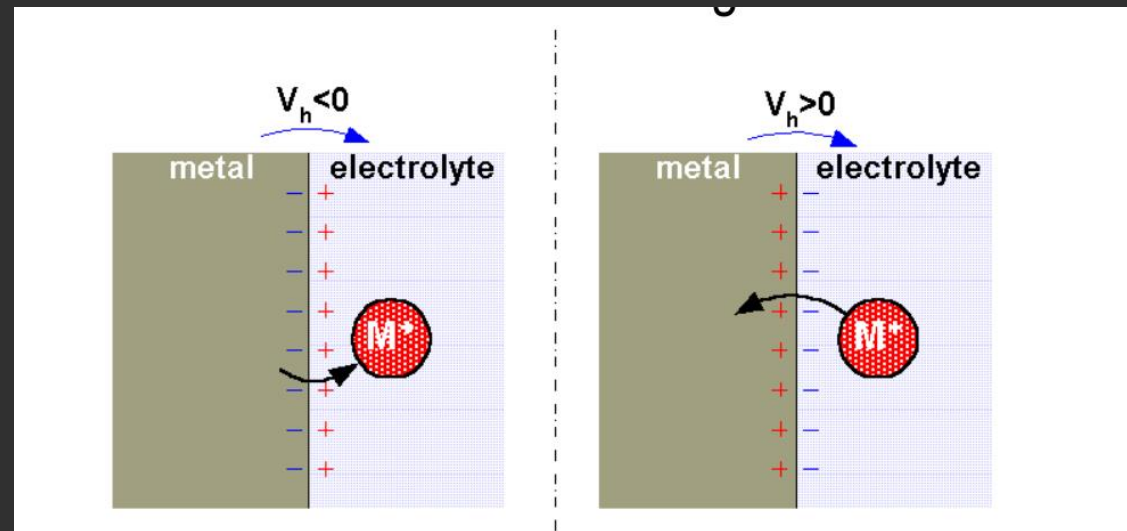


- One cation M^+ out of the electrolyte becomes one neutral atom M taking off one free electron from the metal.



HALF-CELL VOLTAGE

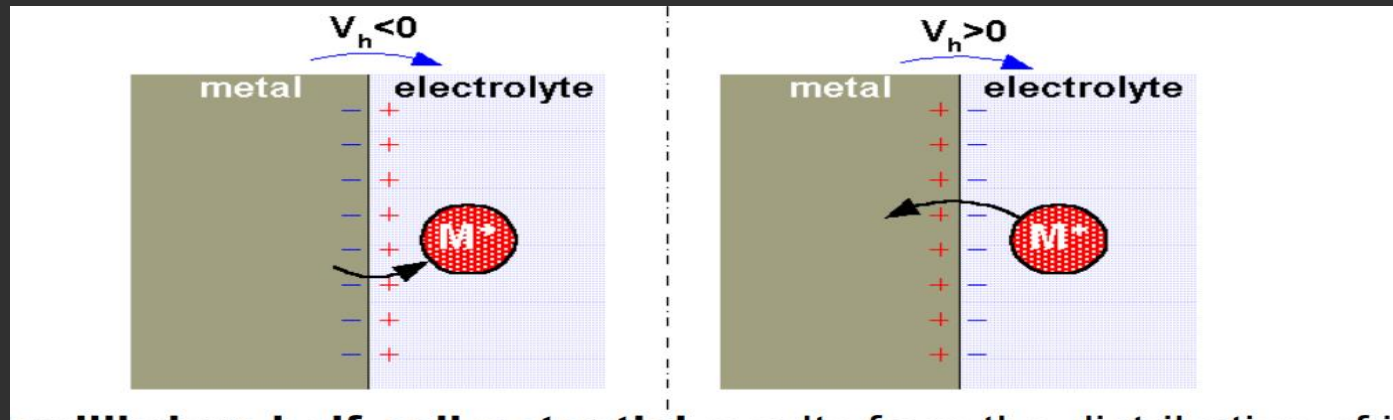
- As reactions reach equilibrium, no current flows between the electrode and the electrolyte. so the rates of oxidation and reduction at the interface are equal.
- Under these conditions, a characteristic potential difference called equilibrium half-cell potential is established by the electrode and its surrounding electrolyte which depends on the metal, concentration of ions in solution and temperature (and some second order factors) .





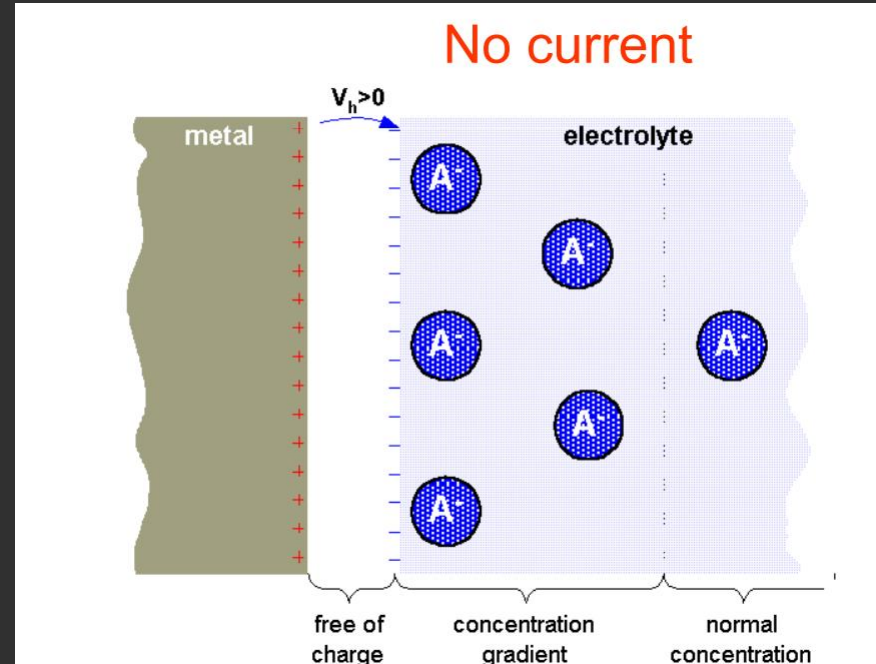
HALF CELL VOLTAGE

- Equilibrium half-cell potential results from the distribution of ionic concentration in the vicinity of the electrode–electrolyte interface.
- Oxidation or reduction reactions at the electrode-electrolyte interface lead to a double-charge layer, similar to that which exists along electrically active biological cell membranes.
- The electrolyte surrounding the metal is at a different electric potential from the rest of the solution.





ELECTRODE DOUBLE LAYER

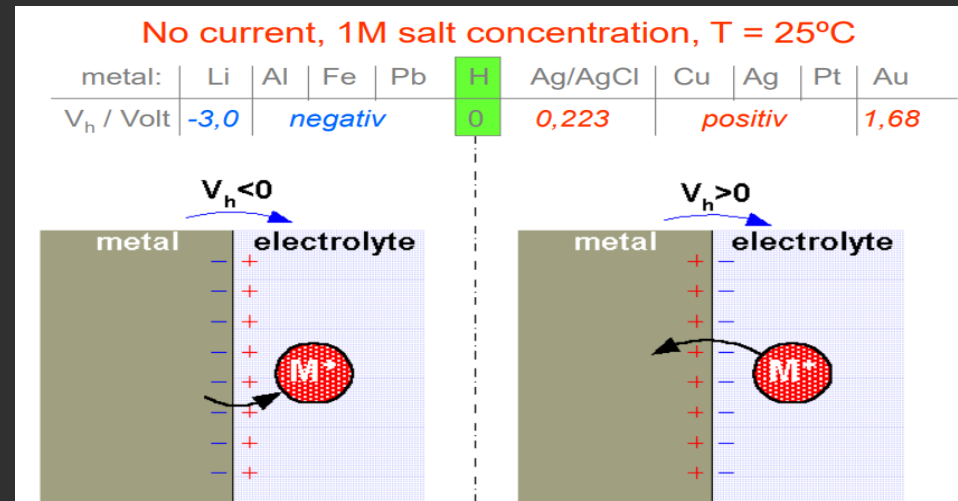




HALF-CELL VOLTAGE

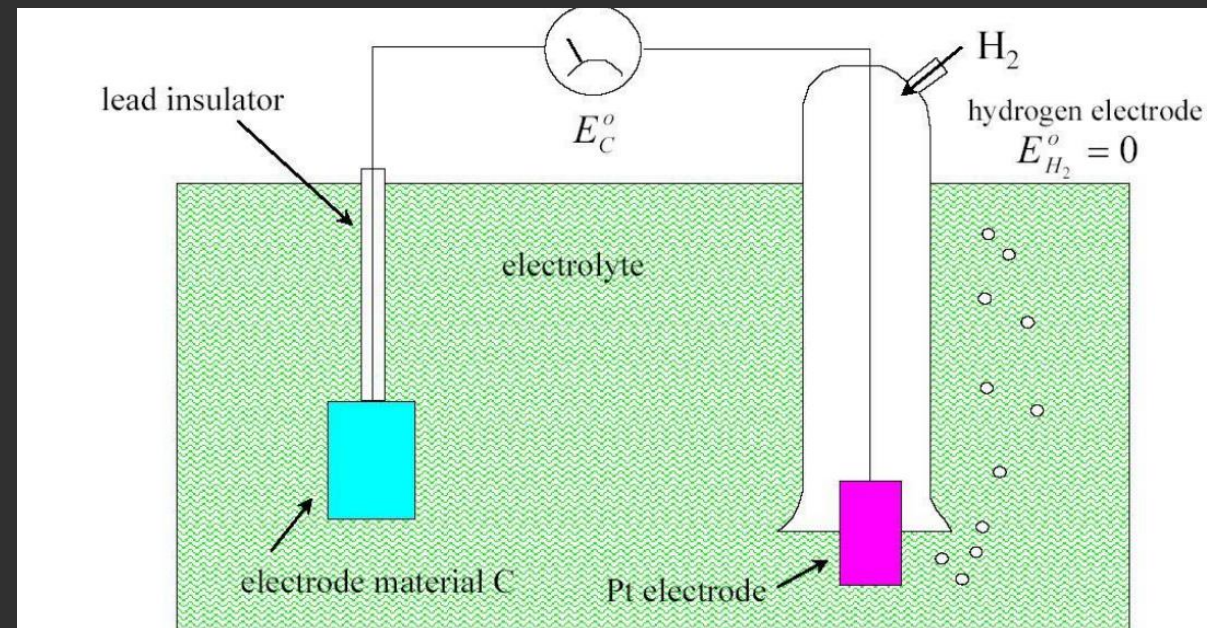


- Half-cell potential cannot be measured without a second electrode. It is physically impossible to measure the potential of a single electrode: only the difference between the potentials of two electrodes can be measured.
- The half-cell potential of the standard hydrogen electrode has been arbitrarily set to zero. Other half cell potentials are expressed as a potential difference with this electrode.





MEASURING HALF CELL POTENTIAL

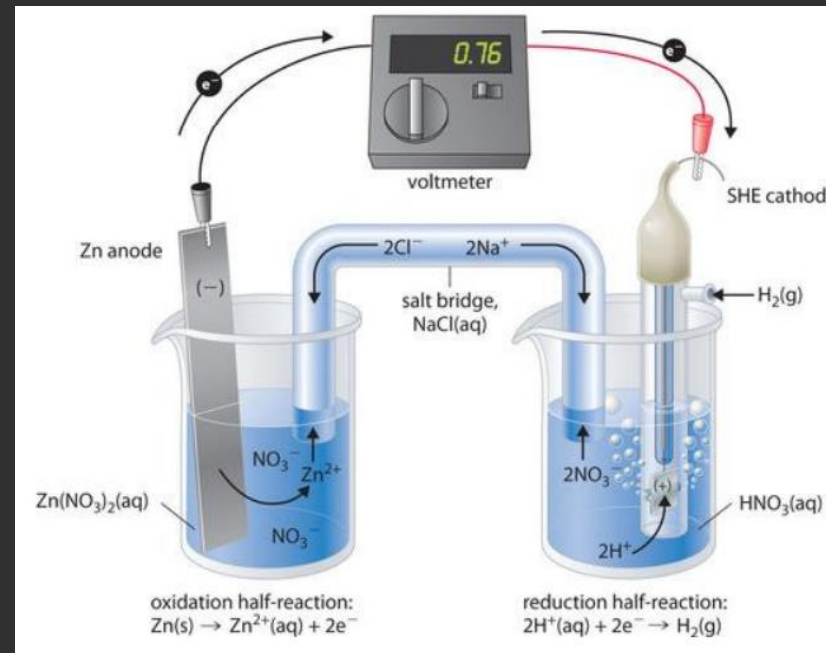


Note: Electrode material is metal + salt or polymer selective membrane



HALF CELL POTENTIAL

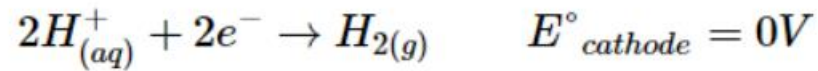
- The standard hydrogen electrode (SHE) is universally used for reference and is assigned a standard potential of 0V. • The $[H^+]$ in solution is in equilibrium with H_2 gas at a pressure of 1 atm at the Pt solution interface.
- One especially attractive feature of the SHE is that the Pt metal electrode is not consumed during the reaction.





HALF CELL POTENTIAL

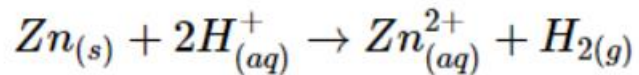
- Cathode



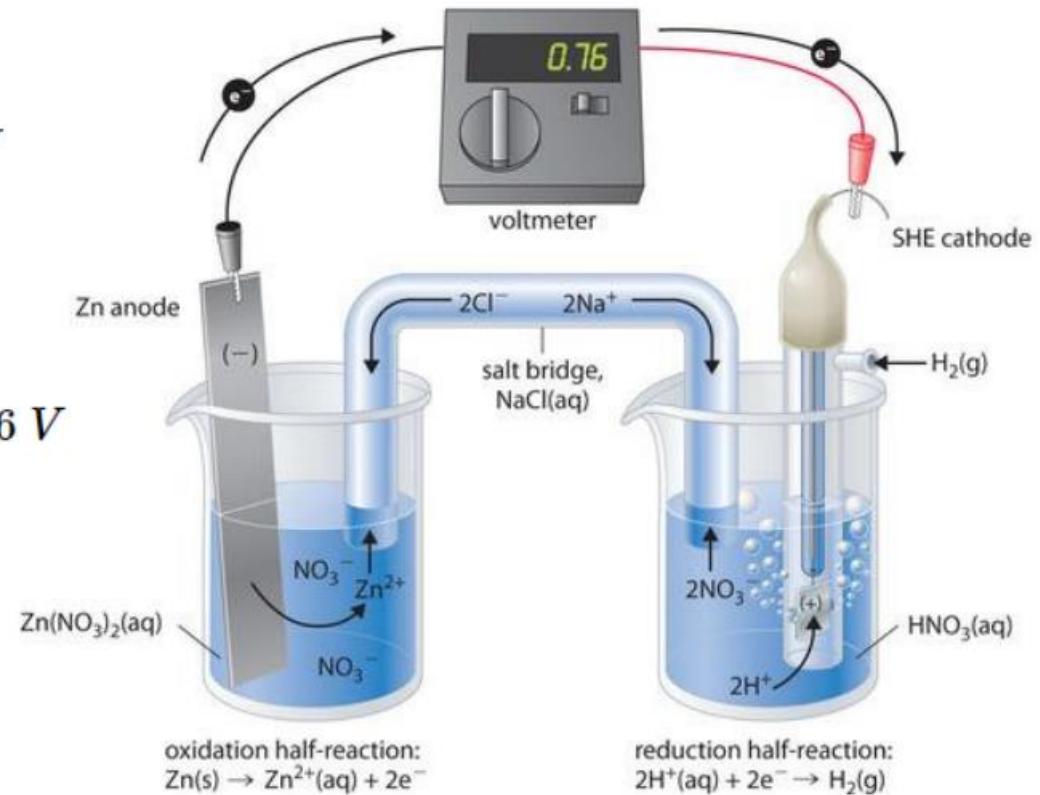
- Anode



- Overall



$$E^{\circ}_{cell} = E^{\circ}_{cathode} - E^{\circ}_{anode} = 0.76 V$$



A top-down photograph of a 'Thank you' card on a white marble surface. The card is white with the words 'Thank you' written in a purple, cursive, glittery font. To the left of the card is a bouquet of small purple flowers with green leaves. To the right of the card is a black pen with a white polka-dot grip. In the bottom right corner, there is a small gift wrapped in white paper with a grey polka-dot pattern, tied with a red and white striped string. A spool of this same string is in the top right corner.

Thank
you