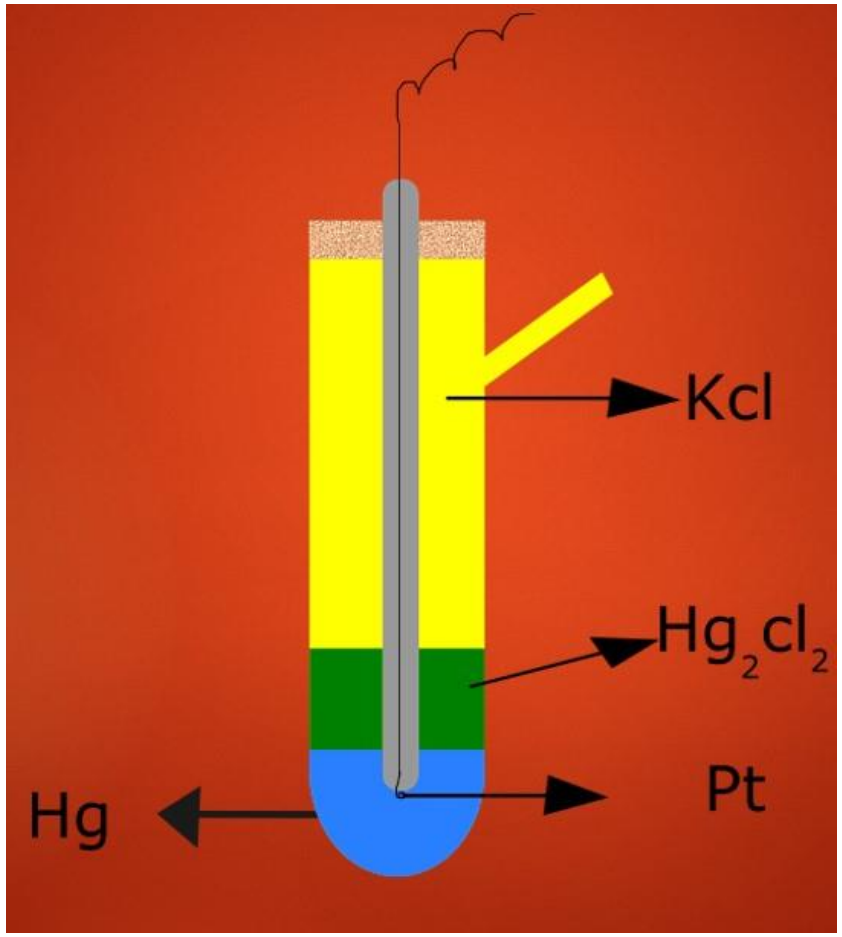
SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution
Coimbatore-35

23CHT101-Engineering chemistry

I B.E. AI & DS/ I SEMESTER

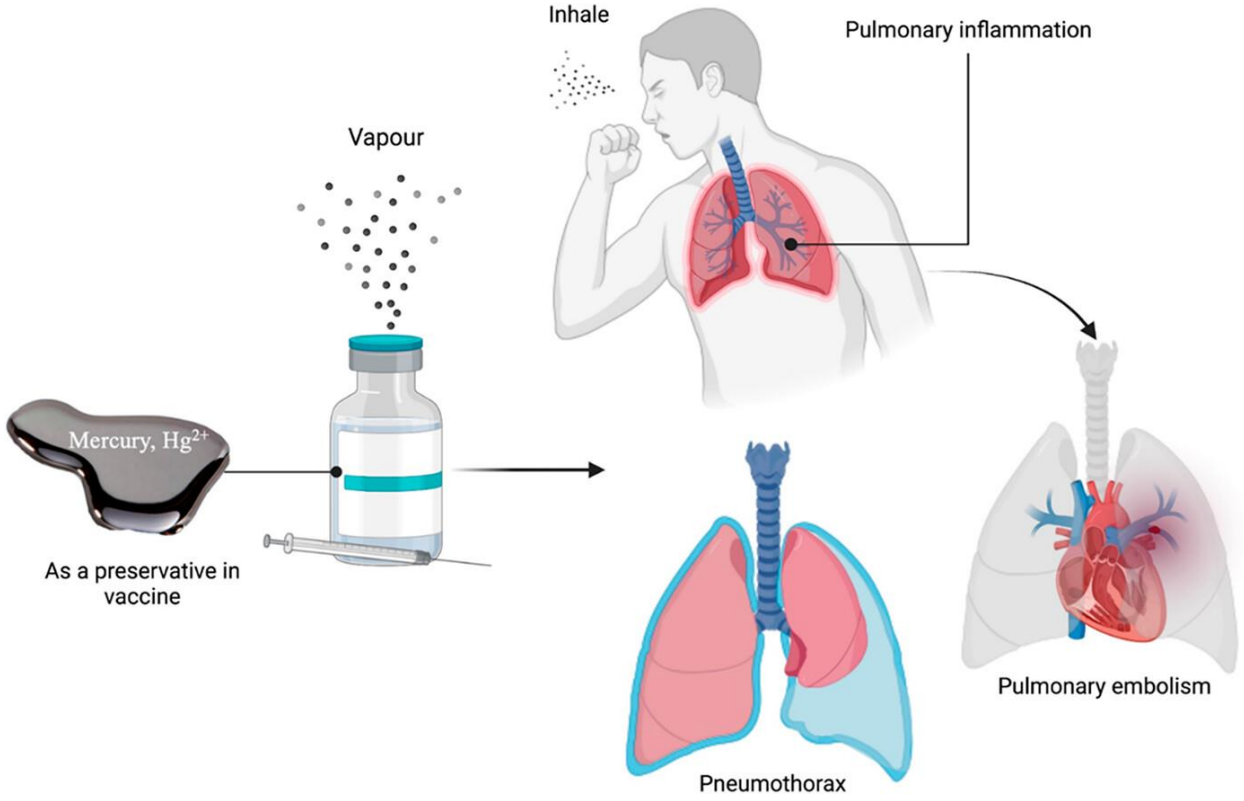


UNIT I ELECTRO CHEMISTRY

CALOMEL ELECTODE

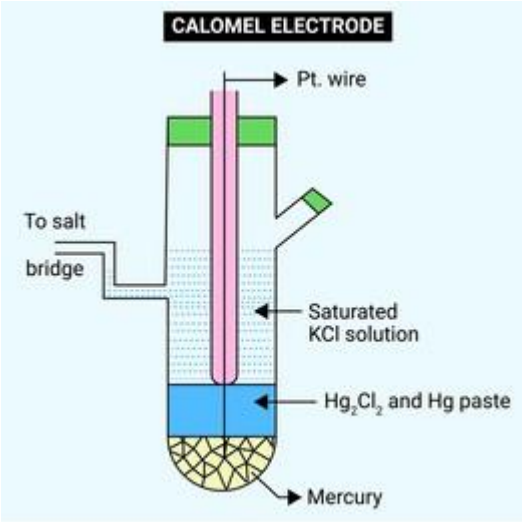
Empathize

Value the Calomel electrode for its stability and reliability, but worry about safety, environmental impact, and fragility. So, there was a modern, safer design that keeps its accuracy without mercury.



Reference electrodes

- Reference electrodes: Crucial role in electrochemical measurements, ensuring stable and reproducible potentials.
- Saturated calomel reference electrodes (SCE), exploring their composition, operational principles, advantages, and limitations.
- It is based on the reaction between elemental mercury and mercury(I) chloride.
- It is a metal-salt electrode consisting of elemental mercury and a paste of mercury(I) chloride (Hg_2Cl_2) also known as calomel.



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Structure and Components

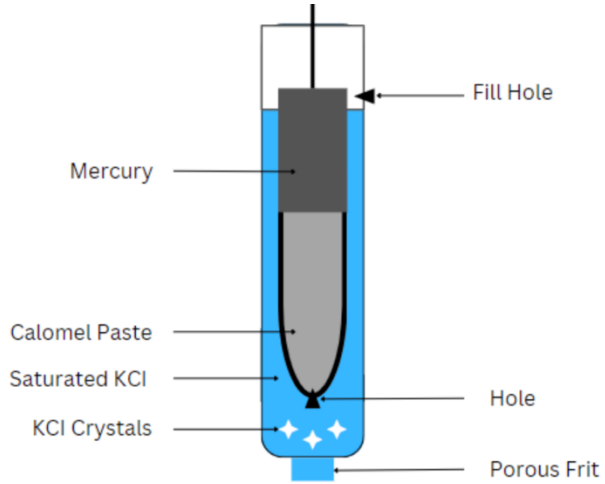
The SCE is constructed with several key components:

- **Mercury (Hg):** The metallic mercury acts as the electrode surface.

- **Mercury(I) Chloride (Hg_2Cl_2):** This calomel layer forms a paste with the mercury, providing the necessary chemical equilibrium for the electrode's operation.

- **Saturated Potassium Chloride (KCl) Solution:** The electrolyte solution is kept saturated to maintain a constant ionic activity, which in turn stabilizes the electrode potential.

- **Platinum Wire:** This component facilitates the electrical contact between the electrode and the external circuit.

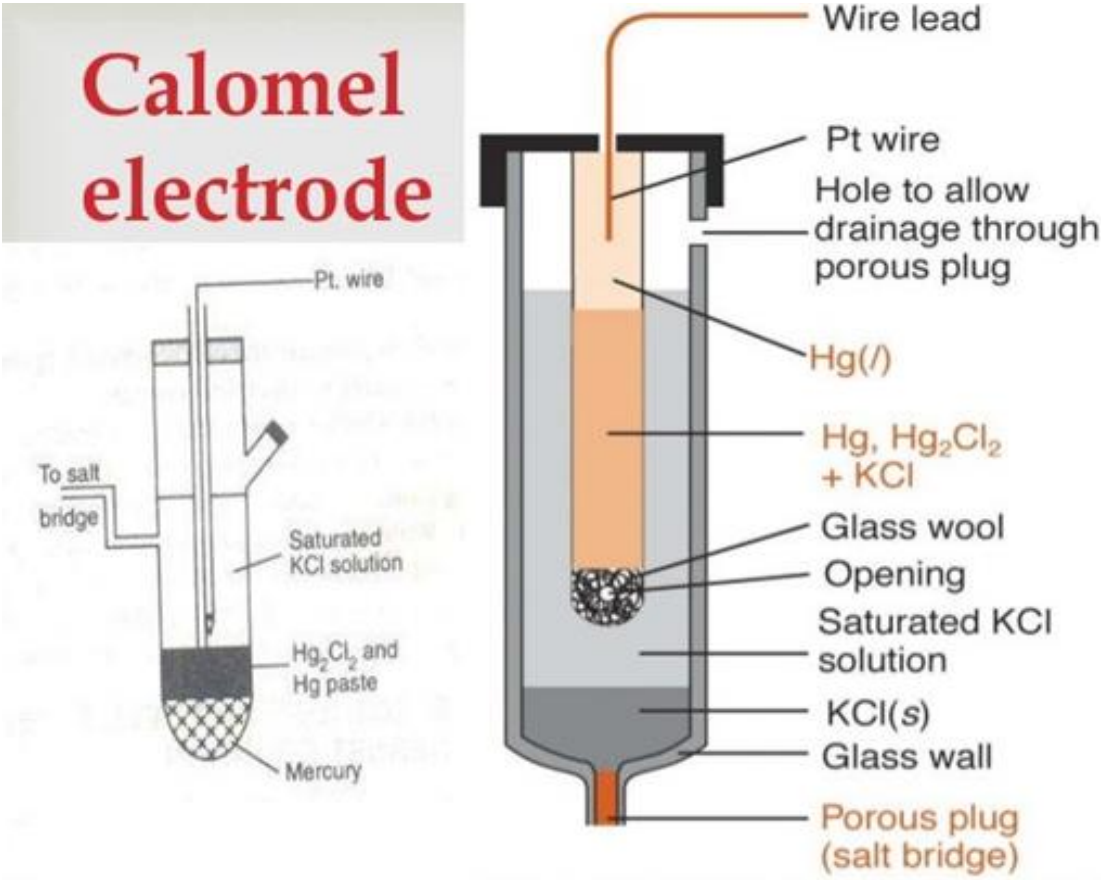


Construction of SCE

The SCE is a widely used reference electrode in electrochemical measurements, known for its stability and ease of use.

It consists of a mercury (Hg) electrode coated with a layer of mercury(I) chloride, also known as calomel (Hg_2Cl_2), which is in contact with a saturated solution of potassium chloride (KCl).

This setup ensures a consistent and reliable reference potential for various electrochemical applications.



Advantages and Disadvantages

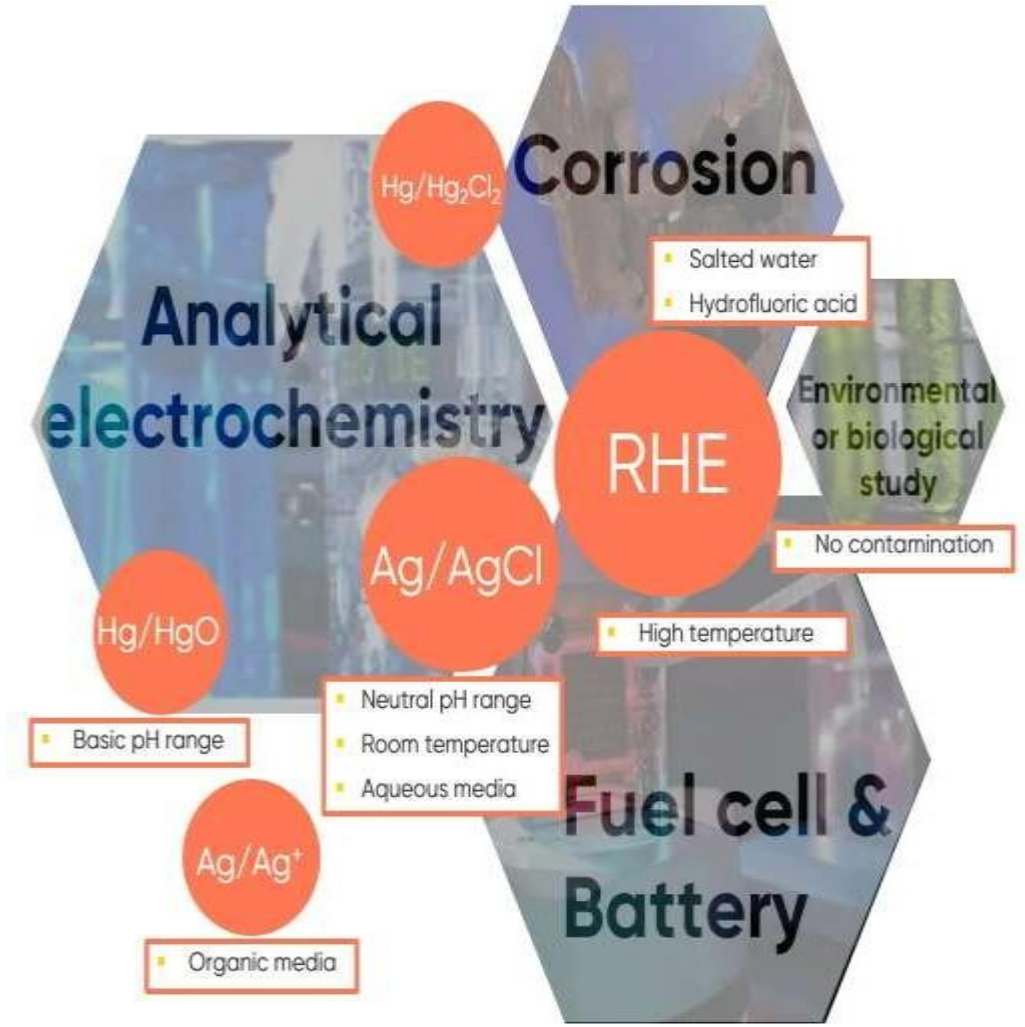
•**Ease of Setup and Reproducibility**: The SCE can be easily reproduced, ensuring consistent results.

•**Compact and Portable**: Its small size and portability make it convenient for various experimental setups.

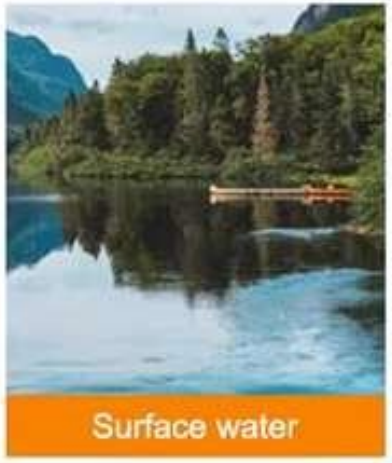
Disadvantages:

Limited Temperature Range: The SCE is typically limited to use below 50°C due to potential instability at higher temperatures.

Interference with Certain Ions: The presence of K+ and Cl- ions in the sample can interfere with the electrochemical reactions

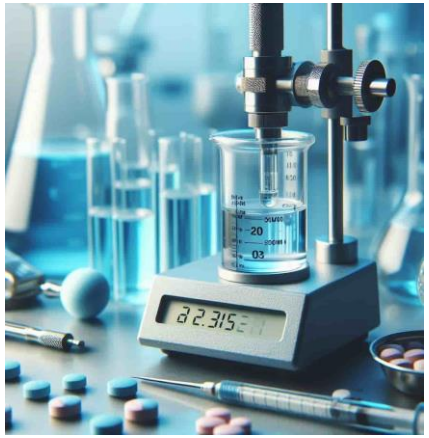


Applications

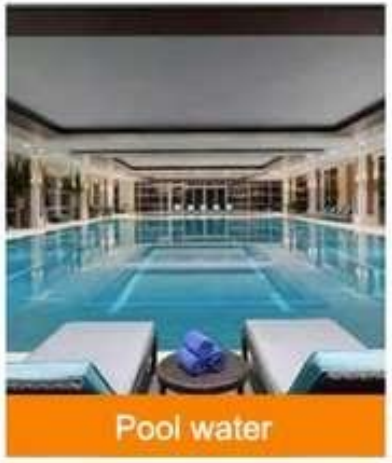

Surface water

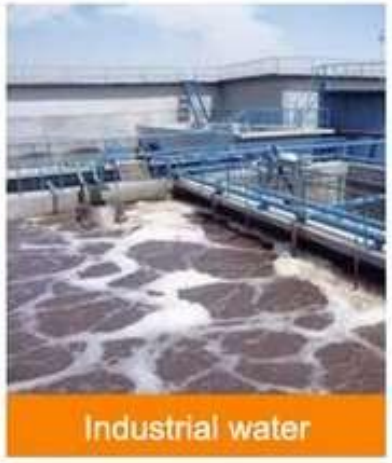

Underground water

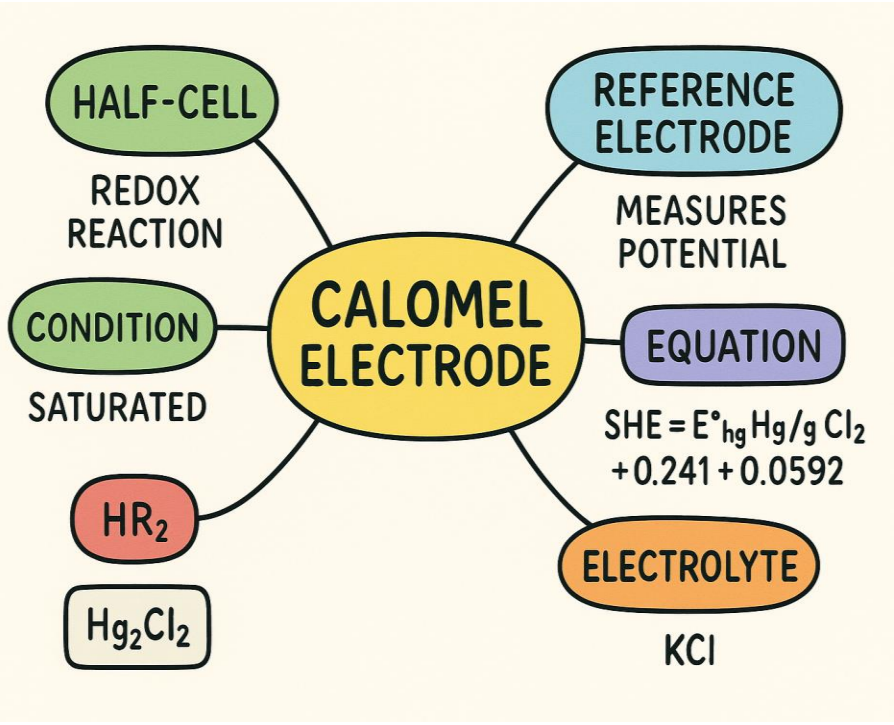

Domestic drinking water




Secondary water supply


Pool water


Industrial water



Assessment- Quiz

•1.The main purpose of the saturated calomel electrode (SCE) is to act as a:

•A. Indicator electrode
B. Reference electrode
C. Working electrode
D. Counter electrode

Option: B

•2. The standard potential of a saturated calomel electrode (SCE) at 25°C is approximately:

•A. 0.000 V
B. +0.241 V
C. +0.500 V
D. –0.241 V

Option: B

References

- https://www.doitpoms.ac.uk/tlplib/pourbaix/other.php
- https://pineresearch.com/products/reference-calomel-standard-single/

THANK YOU