Types of Voltammetry

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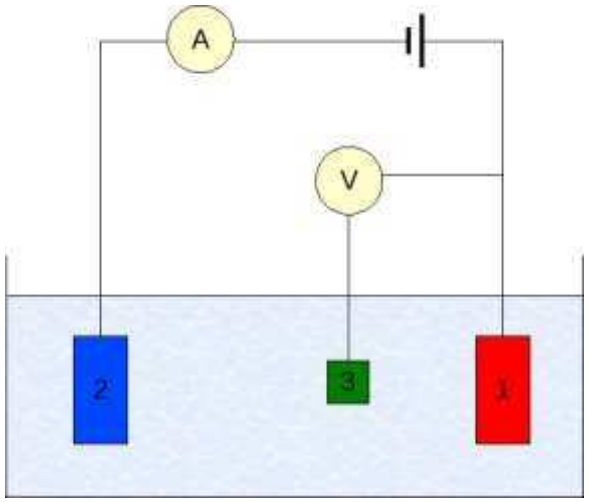
VOLTAMMETRY

- It is an Electro- analytical technique.
- It gives information about the analyte.
- We can even measure the amount of current by varying the voltage.
- The change in current with the varying voltage gives the plot and is known as uoltammogram
- There is a minimum potential required to initiate an oxidation or reduction reaction at an electrode.

INSTRUMENTATION

It is a three electrode system.

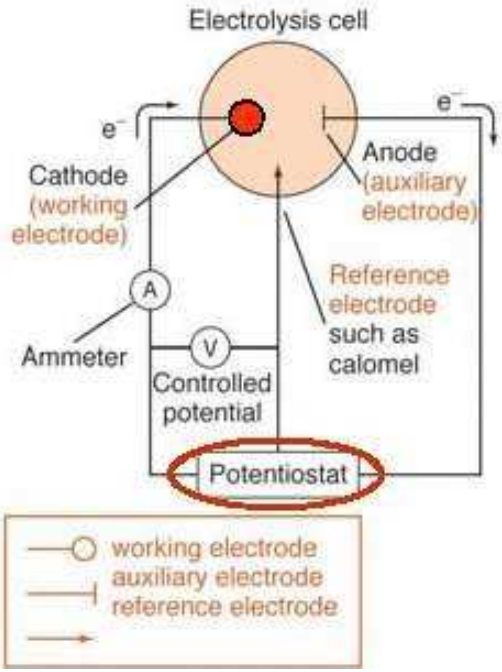
1. Working electrode ;
2. Reference electrode and
3. Auxiliary electrode.



(1) working electrode;

(2) auxiliary electrode;

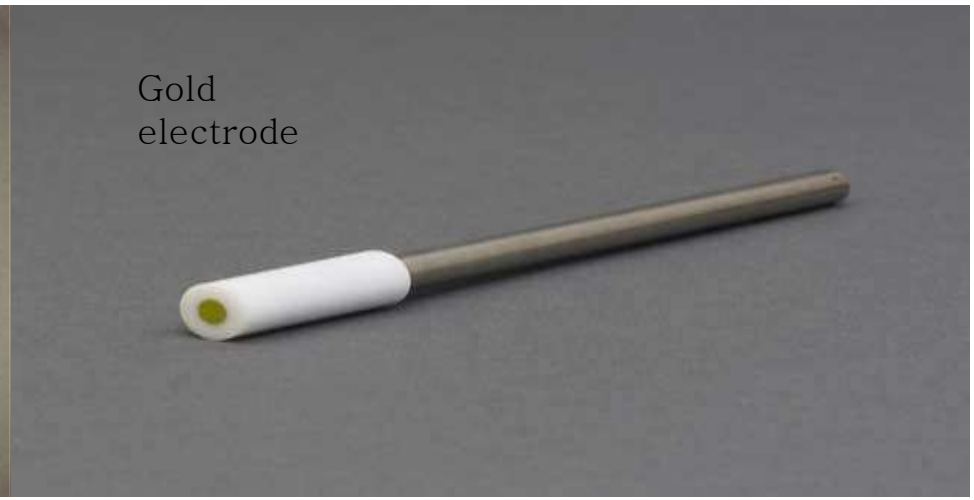
(3) reference electrode



WORKING ELECTRODE

- Ranges from small mercury drop to flat platinum disc.

- Other commonly used electrode materials gold, platinum and glassy carbon.



- Depending on the choice of working electrode, the type of voltammetry is decided.

We use Dropping Mercury Electrode (DME) in Polarography technique We use

Platinum electrode in Cyclic Voltammetry

We use Glassy Carbon as electrode in Linear Sweep Voltammetry.

Reference Electrode

- Usually Standard electrode is used as Reference electrode.
- Its potential is constant.
- It provides potential to the Working electrode.
- Common reference electrode are : Calomel electrode and Ag/AgCl electrode

AUXILIARY ELECTRODE

t is usually a thin **platinum** wire.

t serves merely to **carry the current** flowing through the cell.

Usually **redox** reaction occur simultaneously at the auxiliary
lectrode.

Type of Voltammetry

LINEAR SWEEP VOLTAMMETRY

STAIRCASE VOLTAMMETRY

CYCLIC VOLTAMMETRY

SQUAREWAVE VOLTAMMETRY

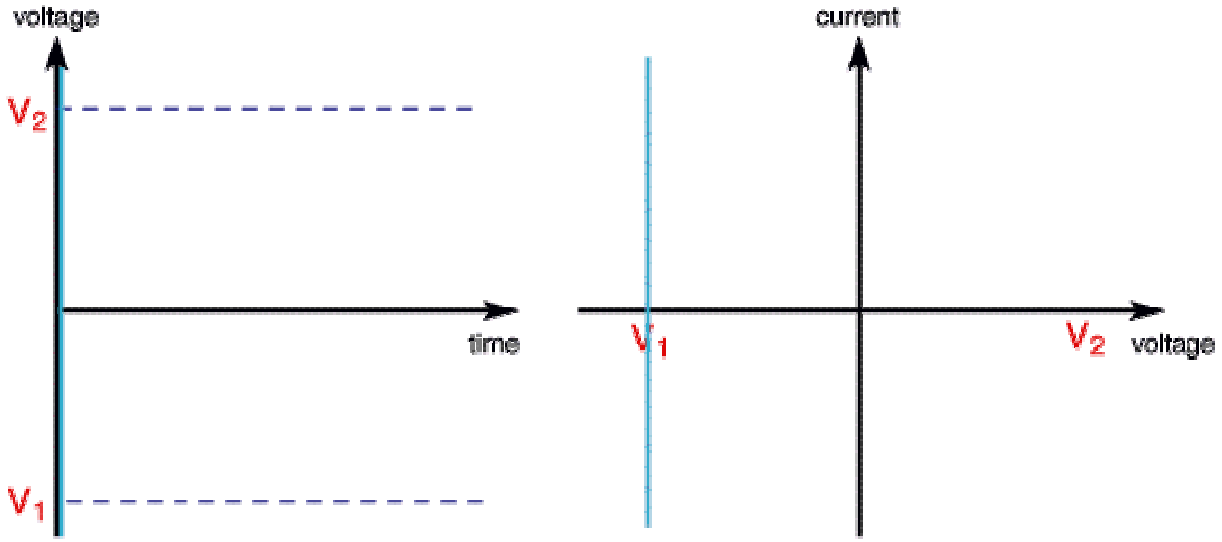
ANODIC STRIPPING VOLTAMMETRY

CATHODIC STRIPPING VOLTAMMETRY

- ABSORPTIVE STRIPPING VOLTAMMET
- ALTERNATING CURRENT VOLTAMME
- POLAROGRAPHY
- ROTATED ELECTRODE VOLTAMMETR
- NORMAL PULSE VOLTAMMETRY
- DIFFERENTIAL PULSE VOLTAMMETRY
- CHRONOAMPEROMETRY.

LINEAR SWEEP VOLTAMMETRY

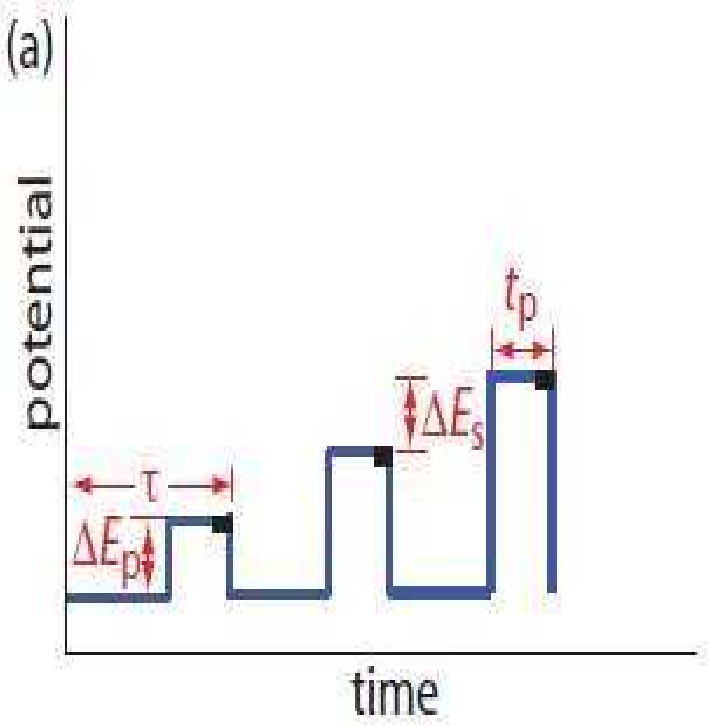
- In linear sweep voltammetry (LSV) a fixed potential range.
- the voltage is scanned from a lower limit to an upper limit.



- In LSV measurements the current response is plotted as function of voltage rather than time.
- The scan begins from the left hand side of the current/volta plot where no current flows.
- As the voltage is swept further to the right (to more reducti values) a current begins to flow and eventually reaches a pe before dropping

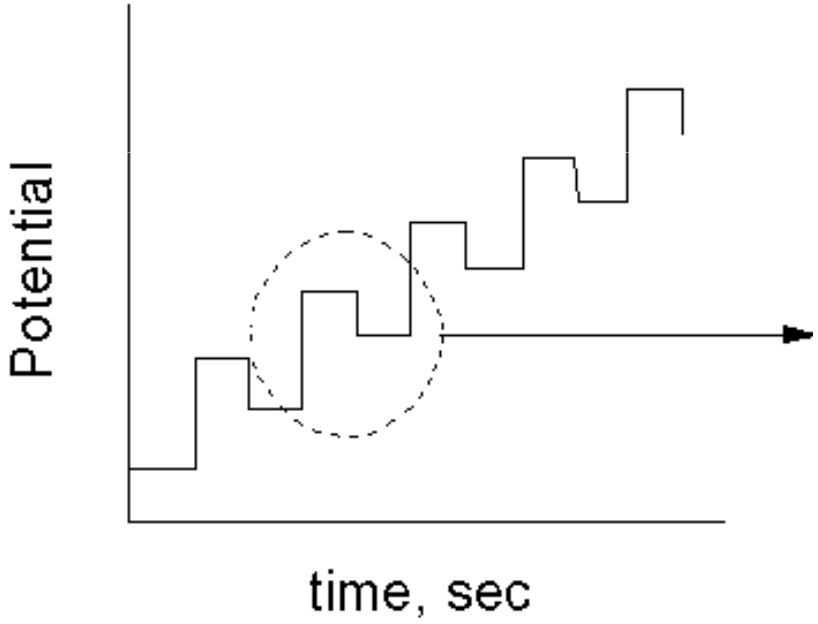
NORMAL PULSE VOLTAMMETRY

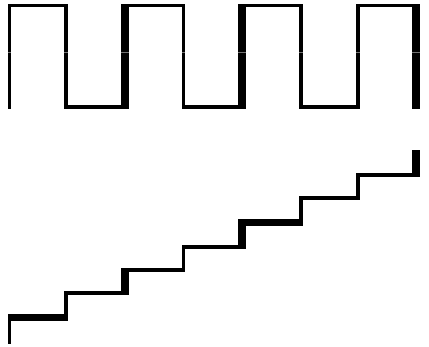
- Normal polarography has been replaced by various forms of pulse polarography.
- It uses a series of potential pulses.
- Here the pulse time (tp) is 50ms.
- Each potential has different amplitude



Differential Pulse Voltammetry

- If potential pulse is applied periodically to the Linear Sweep Voltammetry, then it is kno as Differential Pulse Polarography.
- Hence it is denoted as the differential of linear sweep voltammetry.





The current is measured twice per cycle.

Here the pulse time (tp) is 17ms.

The difference in the two currents gives rise to the peak-shaped voltammogram.

consistent enhancement of the signal is achieved.

Detection limit is as low as 10^{-8} M

Each potential step has the same amplitude