

WELCOME

HIGH FREQUENCY TITRATION

- **INTRODUCTION**

- High Frequency titrimetry is closely related to conductometry
- This method is also called as as oscillometry
- This is analytical technique in which a radio electric field is applied for which electric conductance of analytical substance governs the response of detector
- Major advantage is elimination of electrodes

THEORY

- The conductivity of a sol depends on the mobility of ions in an electric field .
- Use of AC to avoid electrochem depositon still allow ion mobility which at high frequency can not gain their full speed here a phenomenon called molecular polarization arises.
- Thus ionic and orientation polarization occurs .
- When a molecule is placed in a electric field .

INSTRUMENTATION

- The technique of the Frequency analysis was developed by F.W Jensen and A.L parrack.
- The cell employed for H.F . Titration is a glass or ceramic vessel which act as conductivity cell
- The metal electrodes are placed outside container about 2.5cm apart and out of direct contact with the solution.
- Measurements can be made with out the danger of electrolysis and electrode polarization and with out altering or consuming solution.
- When the vessel is placed in the field.any change in concentration will be indicated in detector circuit.

CELLS:

- In H.F Titration two types of cells are used
 - 1. Capacitive cells
 - 2. Induction cells
- CAPACITIVE CELLS:
- Capacitance the variable parameter is capacitance which mainly depends on Dielectric constant and resistance of the solution in the cell.
- Two bonds of copper or silver are put around the outer part of the cell and connected to H.F.O

INDUCTION CELLS

- In case of induction cell the variable parameter is the inductivity of the cell which is almost independent of nature and resistance of the solution.
- There are no electrodes and the cell is placed inside the induction coil in the tuned circuit of oscillator.

OSCILLATOR CIRCUIT

- It consists of capacitance C, inductance L and resistive component R.
- A stage called resonance is attained when the adjustment of circuit capacitance is done.
- When the condenser is discharged through the inductance, current will surge back and forth the conductor to the capacitor at forth from the conductor to the capacitor at a frequency given by
- $F = \frac{1}{2\pi\sqrt{LC}}$

- **PRINCIPAL**

- Cell is filled with a solution of specific conductive K , dielectric constant D .
- C_2 denotes the capacitance into and out of cell through glass wall which is result of capacitors in service.
- In side cell well C_1 & R_1 are capacitance & residence.
- Path length btw electrodes is d cm
- Area A cm³

$$C1 = 1.1DA$$

$$\frac{\quad \times \text{ pf}}{4\pi D}$$

$$R1 = \frac{d}{\quad \text{ kA}}$$

- When a Titration involving electrolytes change in k results In change of D & R_1
- Incase of mixture of liquids c^2 changesb.
- When cell is connected in parallel high frequency conductance & c_p is given by .

$$1. \quad kw^2C_1^2$$

- $G = \frac{1}{R_p} = \frac{K^2 C_1 + w^2 (C_1 + C_2)^2}{K^2 + w^2 (C_1 + C_2)^2}$

- $R_p = \frac{K^2 + w^2 (C_1 + C_2)^2}{K^2 C_1 + w^2 (C_1 + C_2)^2}$

$$C_p = \frac{K^2 C_1 + w^2 (C_1 + C_2)^2}{K^2 + w^2 (C_1 + C_2)^2}$$

- $\omega M^2 I_2$

- $I = I_1 - \frac{\omega M^2 I_2}{R^2 + \omega^2 L^2}$

- $\frac{\omega M^2 I_2}{R^2 + \omega^2 L^2}$

- When r^2 changed both R&L change with corresponding change in frequency & oscillator current of instrument.

HIGH FREQUENCY TITRATION

- To H.F titrimetr range from simple from simple magic eye tube circuit of hall to the complex oscillometer of sergent
- The cell is put in parallel with a calibrated capacitor
- In this method.the out put frequency of two identical ascillator circuit is measured .
- One of the circuit contains the simple cell as a part of oscillator circuit 'f' and other circuit service as reference unit 'fo'
- The output from the two units are then fed in to a mixer unit and the difference of frequency is measured directly
- In some titrimetr s change in ascillator current from the introduction of sample is measured

APPLICATION

- ACID – BASE TITRATION:
- Before carrying HFT it is necessary to determine the response of the instrument as the function of the electrolyte.
- During titration one of the conc.should be Kept constant.
- The acid base titrations give one or more breaks at the end point.
- The unknown sol.can be analysed with the help of these breaks in terms of std alkali or acid added.