



**SRI SATHYA SAI COLLEGE FOR WOMEN, BHOPAL**  
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# **CHEMISTRY**

# **DEPARTMENT**

# CHROMATOGRAPHY

## HISTORY

Chromatography was first devised in Russia by the Italian born scientist Mikhail Tsvet in 1900. He developed the technique and coined the term chromatography in the first decade of 20<sup>th</sup> century, primarily for the separation of plant pigment such as chlorophyll, carotenes and xanthophylls.

## DEFINITION

In chemical analysis, chromatography is a laboratory technique for the separation of a mixture into its components. The mixture is dissolved in a fluid solvent (gas or liquid) called the mobile phase, which carries it through a system (a column, a capillary tube, a plate or a sheet) on which a material called the stationary phase is fixed.

## APPLICATION

Chromatography is used in many fields including the pharmaceutical industry, the food and beverage industry, the chemical industry, forensic science, environment analysis, and hospitals.

Paper

Thin layer

Column

**PROCESS OF PAPER CHROMATOGRAPHY**

**In paper chromatography the end of the paper is dipped in solvent mixture consisting of aqueous and organic component.**

**PROCESS OF THIN LAYER CHROMATOGRAPHY**

**Thin layer chromatography is a chromatography technique used to separate non-volatile mixture.**

**COLUMN CHROMATOGRAPHY**

**Column chromatography in chemistry is a chromatography method used to isolate a single chemical compound from a mixture.**

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**B.Sc I YEAR**


### CHROMATOGRAPHY

It is a technique which is extensively used to separate components from mixture and to purify compound.

The basis of separation of component present in a mixture by chromatography is either different in attraction or affinity with the mobile phase.


#### Classification of chromatography (on the basis of separation)

##### Absorption Chromatography



Adsorption is the adhesion of atoms, ion or molecule from a gas, liquid or dissolved solid to a surface. It is based on the interaction of adsorbate with the adsorbent.

##### Partition Chromatography




#### Retention Factor (R<sub>f</sub>):

It is the ratio of distance travelled by solute to solvent.

$$R_f = \frac{\text{distance travelled by solute}}{\text{distance travelled by solvent}}$$

#### Classification of chromatography (on the basis of adsorption)

##### High Performance Liquid Chromatography (HPLC)



HPLC: High pressure liquid chromatography is used to identify, separate and quantify the components of a mixture.

Principle: It is based on the principle of column chromatography, which is based on principle of adsorption.

Application:  
HPLC is used in ->  
1. Water purification  
2. Detection of impurities  
3. In pharmaceutical industries  
4. In clinical applications

##### ION EXCHANGE CHROMATOGRAPHY

It separates ions and polar molecules.

Principle: It is based on the principle of varying ionic strength or ionic affinity.

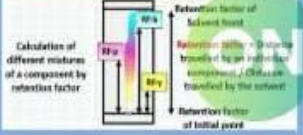
Applications:  
1. In routine analysis of amino acid mixtures  
2. Extraction of enzymes  
3. Used in softening of water  
4. Determination of base composition of nucleic acid

##### GAS CHROMATOGRAPHY

It is used in analytical chemistry for separating and analysing compounds that can be vaporized.

Principle: It is based on the principle of boiling point; the component which has lower boiling point elutes first.

Applications:  
1. Used in food analysis  
2. Measuring air pollution  
3. Blood alcohol analysis  
4. In forensic science  
5. In research of meteorites



Calculation of different mixtures of a compound by retention factor

Retention factor of solvent front

Retention factor of component

Retention factor of initial point

#### IMPORTANCE:

1. It is used to know the polarity of a component
2. Used to compare and identify the compound.

TRACK ID: MPCOGN11415

NAAC SSR SUBMISSION 2024 Cycle - III

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