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Chromatography a Basic Journey about Introduction and Classification

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Abstract

Chromatography is an analytical developed tool or technique to evaluate, isolate, extract and identify of drug product. In the modernized era of pharmaceutical science it can be used in a modernized manner.

This review article followed the basic details about these techniques of chromatography including its classification on the basis of various parameters like stationary and mobile phase used that plays vital role in this tool or on the basis of its principle of working also on the basis of components used and on its phase.

This review article also focused on basic introduction about all classified types of chromatography and provides basic knowledge about gel chromatography, ion exchange chromatography.

Keywords: Chromatography; Pharmaceutical science; Drug product; Mobile phase

Introduction

- Chromatography is the separation of a mixture into individual components using a stationary phase and a mobile phase.
- Chromatography involves employing a stationary phase and a mobile phase to separate a mixture into its component parts.
- Chromatography is the process of separating a mixture into its component parts utilizing a stationary phase and a mobile phase.

Description

Types of chromatography

Based upon the nature of stationary and mobile phase

Depending on the stationary and mobile phases utilized, there are various types of chromatography. Those are:

- Gas-Solid chromatography.
- Gas-Liquid chromatography.
- Solid-Liquid chromatography (Column chromatography, thin layer chromatography, HPLC (High Performance Liquid Chromatography)).
- Liquid-Liquid chromatography (Paper partition chromatography, column partition chromatography).

Based on the principle of separation

- Adsorption or partitioning is two possible separating principles. As a result, they can be referred to as partition or adsorption chromatography.
- The precept of separation may be either adsorption or partition. Hence they may be referred to as adsorption chromatography or partition chromatography.

Adsorption chromatography

- When a mixture of substances (the adsorbate) dispersed in the mobile phase (the eluent) passes through a column of stationary phase (the adsorbent), they move in accordance with their relative affinities for the stationary phase.
- The compound that is more agglomerative toward stationary phase moves more slowly, whereas the compound that is less agglomerative toward stationary phase moves more quickly.
- Consequently, the compounds are divided.
- The affinity of a compound for a given set of stationary phase, mobile phase, and other conditions varies amongst different compounds.

Examples: Illustrations of separation processes based on adsorption

Gas-solid chromatography, thin layer chromatography, column chromatography and HPLC (High Performance Liquid Chromatography).

Partition chromatography

- A combination of solutes will be distributed in accordance with their partition co-efficient when there are two immiscible liquids present.
- The component that is more soluble in the stationary phase moves more slowly when a combination of compounds is dissolved in the mobile phase and passed through a column of liquid stationary phase.
- The element that is more soluble in the mobile phase moves more quickly.
- As a result, the components are divided due to variations in their partition coefficient.
- For a specific set of stationary phase, mobile phase, and other conditions, no two components have the same partition coefficient.
- As such, the stationary phase can't be a liquid.
- In order to create a thin liquid layer that serves as a stationary phase, a solid support is employed.
- The principle behind counter current extraction is similar. Two immiscible solvents flow in opposition to one another in this system.
- Depending on the partition coefficient of various solvents, the solute mixture is divided among them.
- The benefit is that because new solvent is in contact, extraction is successful and the solute combination is broken down into its component parts.

Examples where partition is the principle of separation

Gas liquid chromatography, paper partition chromatography, column partition chromatography, etc.

Based on the modes of chromatography

There are two varieties. They are based on the polarity of the mobile phase and stationary phase that are being used.

- **Normal phase chromatography:** This has a polar stationary phase and a non-polar mobile phase. Pharmacy does not frequently use this.
- **Reverse phase chromatography:** Mobile phase is polar in this case, but stationary phase is non-polar. The analysis of pharmaceuticals is where this is most frequently employed.

Other types of chromatography

Ion exchange chromatography

- This kind uses an ion exchange resin.
- Similar charged ions and those of the ion exchange resin undergo reversible ion exchange.
- Cations are separated using a cation exchange resin, and mixtures of anions are separated using an anion exchange resin.

Gel permeation chromatography (gel filtration, size exclusion chromatography)

- According to their molecular sizes, components of a mixture are separated using a gel.
- Different gels are used for different molecular weight ranges.
- The type of solvent employed might either be aqueous or nonaqueous.
- A porous matrix makes up the stationary phase.
- The matrix is composed of a wide range of substances, including cross linked polystyrene.
- Polyvinyl acetate gels, crosslinked dextrans (sephadex). Polyacrylamide gels, agarose gels.
- Aqueous buffers or organic solvents can be employed as mobile phases.
- The differential refract metric detector is the one that is most frequently employed.
- Electrochemical detectors, UV visible detectors, and other devices are utilized for a certain class of chemicals.
- Steric and diffusion effects in the pores of various gels are the mechanism at play in the separation process.
- This method is employed in the separation of synthetic polymers, polysaccharides, enzymes, and proteins.

Chiral chromatography

Using chiral stationary phases, optical isomers (levo and dextro form) can be separated in this sort of chromatography.

Conclusion

Chromatography is based on the differences in the rate at which components of mixture moves through a porous medium (called stationary phase) under the influence of some solvent or gas (called moving phase). Graph showing detector response as a function of a time is called chromatogram. The true separation of two consecutive peak on a chromatogram is measured by resolution.