- **Extraction**

it is the process of transferring a substance or compound from one place to another. This extraction method can be liquid-liquid extraction or a liquid-solid extraction. In a liquid-liquid extraction separation is based on the solubility of compounds in solvents. One common extraction chemistry technique is an **acid-base extraction**, which is a liquid-liquid extraction. This acid-base extraction separates compounds based on the direction of equilibrium in an acid-base reaction. The extraction method can also be used to isolate a desired substance from a mixture or remove impurities. Extraction is important in chemistry because a scientist can use this method to separate a desired substance to use in other applications.

The act of making tea or coffee is an everyday example of extraction. This extraction is a liquid-solid extraction, where the tea leaves or ground coffee are solid.

The tea or coffee is transferred to the liquid, which is water. In this liquid-solid extraction, the end product is a hot tea or coffee drink.

Uses of Extraction

There are several reasons to use extraction in the chemistry lab. It is a principal method for isolating compounds from plant materials. Extraction moves compounds from one liquid to another, so that they can be more easily manipulated or concentrated. It also enables the selective removal of components in a mixture.

Email: Zahraa.Salah.Hadi@uomus.edu.iq

Al-Mustaqbal University
Department of Techniques of Fuel and Energy Engineering
First stage
Subject: Analytical chemistry UOMU027011
Lecturer: Zahraa Salah Hadi
1st term – Lect 2

Types of Extractions

In the two main types of extraction, which are liquid-liquid extraction and liquid-solid extraction, the separation is based on solubility. The acid-base extraction is a liquid-liquid extraction that is based on acid-base reactions and a substance will be extracted when reacting with an acid or a base.

If an organic solvent contains a polar compound and a non-polar compound, a liquid-liquid extraction can be performed to extract the polar compound out of the organic solvent. This extraction process will take place because the polar compound will be more soluble in a polar solvent, like water. This extraction will have a general procedure similar to the following procedure.

Organic solvents containing both polar and non-polar compounds are added to a **separatory funnel**. This separatory funnel is a piece of lab equipment that has two openings, one on top with a cap and the other at the bottom with a stopcock. Before adding anything to a separatory funnel, always make sure the stopcock is closed. A ring stands with an iron ring to hold the separatory funnel upright.

Email: Zahraa.Salah.Hadi@uomus.edu.iq

- **Precipitation**

is the process of forming a solid in a solution during a chemical reaction. When a reaction occurs in a liquid solution, the solid formed is known as a precipitate, and the reaction that causes the precipitate to form is called a precipitation reaction. Certain types of precipitates do not settle (settle) to the bottom of the reaction vessel due to gravity, but remain suspended in the solution, which can be converted to a precipitate by centrifugation.

An example of inorganic precipitation reactions is the reaction between silver nitrate and sodium chloride, where silver precipitates as a white precipitate, as in the following reaction:

$$NaCl_{(aq)} + AgNo_{3(aq)} \rightarrow Na^{+} + No_{3}^{-} + AgCl\,Cl_{(s)} \downarrow$$

An example of organic precipitation reactions is the reaction between porphyrin in reflux distillation with pyrolytic acid, then cooling the element to room temperature, then completing filtration.

- **Chromatography**

is one of the analytical techniques used to separate and estimate a mixture of different chemical compounds based on physical changes and effects. This technique consists of two phases: **a mobile phase** and a s**tationary phase**.

Email: Zahraa.Salah.Hadi@uomus.edu.iq

The process is carried out by dissolving the mixture whose components are to be separated in the mobile phase, then passing the mobile phase with its components from the top of the column filled with the stationary phase and receiving the separated compounds at the bottom of the column at different times.

The material to be separated is distributed between the mobile and stationary phases, either by different solubility, polarity, degree of ionization, or size differences.

The mobile phase can be either an inert gas, as in gas chromatography (GC), or a liquid substance consisting of one or more solvents in specific proportions, provided that the mixture (model) compounds are completely dissolved in it, as in liquid chromatography (LC).

Types of Chromatography

There are several classifications of chromatography technology

1-Based on the principles on which it works.

a-Adsorption Chromatography

b-Partition Chromatography- Distribution Chromatography

c-Ion exchange chromatography

d- Size exclusion chromatography

2-Based on the geometric shape of the technique.

a-Column Chromatography

b-Thin layer Chromatography

c-paper Chromatography

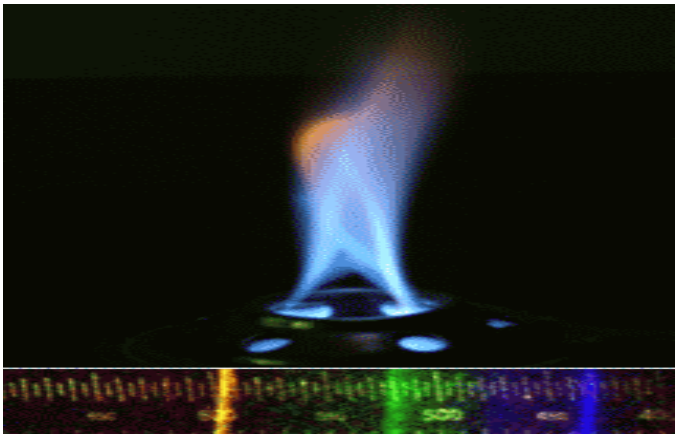
The stationary phase (which is either a solid or a liquid fixed to a fixed support and is usually placed in the column or painted on a plastic or glass plate or a piece of paper.

The mobile phase (is either a liquid or a gas that passes through the stationary phase and does not transport the components of the mixture) of the substance to be analyzed

The importance of studying chromatography is primarily in using analytical methods to determine the internal compounds in a mixture from a quantitative and quantitative point of view.

- **Spectroscopy**

It is the science of the interaction of radiation (whether electromagnetic or particle radiation) with matter, which includes atoms and molecules.



Spectroscopy is used in various fields of science and technology, including chemical analysis, environmental monitoring, material characterization, forensic analysis, medical diagnosis, and astronomical studies.

The **goal of any optical spectrometer** is to measure the interaction (absorption, reflection, scattering) of electromagnetic radiation with a sample or the emission (fluorescence, phosphorescence, electroluminescence) of electromagnetic radiation from a sample.