Terminology

Solvents

Solvents can also be used to extract soluble compounds from a mixture, the most common example of which is the most common example of the common being the infusion of tea in hot water (water is the most common solvent) is a substance which has the power to form a homogeneous solution with other substances. Solvents are used for extracting (chemical, petrochemical, pharmaceutical and food industry), dissolving (degreasing) and suspending (paints) substances that are usually insoluble in water or to alter the properties of the of a material (e.g. Thinner). According to their molecular structure, solvents are also classified into:

Polar protic solvents (protogenic solvents): possessing one or more hydrogen atoms capable of forming hydrogen bonds. For example, water, methanol, ethanol, etc.

Polar aprotic solvents: possessing a non-zero dipole moment and devoid of hydrogen atoms capable of forming hydrogen bonds. For example, acetonitrile (CH_3CN), dimethyl sulfoxide (DMSO, $(CH_3)_2SO$), tetrahydrofuran (THF, C_4H_8O), etc.

Nonpolar aprotic solvents: with zero permanent dipole moment. For example, benzene, hydrocarbons: linear or branched alkanes, cyclic alkanes, alkenes, etc.

Aromatic solvents have a single benzene ring with one or more side chains (toluene, xylene, etc.). These compounds are widely used in the formulation of industrial paints. The term heavy aromatic hydrocarbon is used when there are three or more carbons in total on one or more side chains.

Ethers: Are a family of oxygenated substances. They are characterized by the ether bond, formed by an oxygen atom -O- located between two groups R and R'. They result from the dehydration of two alcohols to form the R-O-R' bond where R and R' are more or less complex and branched chains that can join together to form a cycle.

Organic esters: Are a family of oxygenated solvents characterized by the presence of a carboxyl group within a more or less long carbon and hydrogen chain. They are obtained by reacting an organic acid with an alcohol. Esters have low surface tensions and occur in a wide range of evaporation rates.

They are colorless liquids. Those of low molecular weights are partially soluble in water. Acetates are the esters most commonly used as solvents. They are volatile at room temperature.

Extraction: It is used to selectively extract one or more compounds from a initial mixture, based on chemical or physical properties. Man has been using dyes, perfumes, flavors, and extracts of natural products since ancient times, using different techniques:

- **Filtration:** Since prehistoric times, man has used a bed of sand or moss to make muddy water (full of mud) clear (clear and transparent).
- **Pressing:** Involves pressing an orange to get the juice, or crushing flowers to extract the aromas.
- **Enfleurage:** Is a form of extraction used in perfumery. It is based on power absorption of an essential oil by fatty substances. For example, fragile flowers are placed on frames coated with very pure and odorless animal fat that absorbs the fragrance of the flowers on contact; At the end of drying, the fats are impregnated with odorous substances.
- **The decoction:** This method is very old. It consists of heating the root or bark of a plant with water; until the latter is boiling and the constituents dissolve.
- **Infusion:** It consists of pouring boiling water on plants (leaves or flowers) finely ground and then let them soak to dissolve their active ingredients.
- **Maceration:** Consists of letting a solid stay cold in a liquid to extract it the soluble constituents in this liquid.
- **Solvent extraction:** This is a process that extracts compounds that cannot be used tonot be with water.

Filtration is a separation process that separates the constituents of a mixture that has a liquid phase and a solid phase through a porous medium. It is a technique widely used in the food industry or pharmaceuticals or by many animal species, mainly aquatic. The use of a filter makes it possible to retain particles from the heterogeneous mixture that are larger than the holes in the filter (porosity). The liquid that has undergone filtration is called filtrate, and what the filter retains is called a residue.

Ultrafiltration

It is a separation of macromolecules in solution in a dispersing phase. It is a membrane with a very low porosity (25 nm) that can retain proteins and nucleic acids. It allows the concentration of macromolecule solutions and the elimination of the most small molecular weight contaminants (salts, carbohydrates, etc.).

Centrifugation

Is a technique that allows the separation of compounds from a mixture based on their density under the action of centrifugal force. It makes it possible to recover a precipitate (pellet) and a supernatant. The mixture to be separated can consist of two liquid phases or solid particles suspended in a liquid.

Chromatography

Is a method of separating constituents present in various mixtures. It is used in analysis to purify, identify and quantify compounds in various samples. The basic principle is based on the concentration equilibria that appear when a compound is placed in the presence of two immiscible phases, one called stationary, is imprisoned in a column or fixed on a support, and the other, called mobile, moves in contact with the first. If several compounds are present, they are carried away at different speeds, causing them to separate.

Ion exchange chromatography

It allows the separation of charged molecules (the separation is a function of the electric charge). The stationary phase is a solid with special properties called an ion exchanger consisting of a resin carrying negatively or positively ionized groups, exerting electrostatic (ionic) interactions with ionized compounds (proteins). Ion exchangers are insoluble macromolecules carrying ionizable groups with the property of reversibly exchanging some of their ions in contact with other ions from a solution.

Electrophoresis

Is a technique for moving ions (molecules that have lost their electrical neutrality) under the effect of an electric field. These migrate to their respective electrodes: The anions migrate to the anode and the cations migrate to the cathode. For uncharged molecules, there is no migration. Due to their specific characteristics and the conditions of electrophoresis, the migration speed and the distance traveled in the matrix by these ions differ, which allows their separation.

Dehydration

This stabilization technique is very old: It is based on the decrease in the water activity of the product. From the earliest antiquity, grains, fruits, meats and fish have been dried in the sun. Later, drying was carried out in ovens. Today, food is dehydrated by various techniques: hot air dryers,

heating cylinders, etc. The purpose of dehydration is to remove most of the bound water present in the product to prevent the development of microorganisms and block enzyme activity.

There are dehydration tunnels comparable to the tunnels used for freezing. Food is subjected to a current of hot, dry air. Air is both the source of heat (by convexion) and the vehicle for the elimination of water vapour. Products obtained by dehydration (powdered milk, cereals, dried fruit)

can be stored at room temperature in packaging that protects them from moisture. Current dehydration techniques make it possible to preserve the nutritional qualities of foodstuffs.

Freezing:

This is the most critical phase of the freeze-drying cycle as it must ensure that the product to be freeze-dried will not be tampered with. It consists of slowly reducing the temperature of the product to a value between -20°C and -80°C, so as to block the water in solid form (without crystals) in the situation where it was in a liquid state; to prevent damage to cells, vaccines, enzymes, or any other active ingredient. On the other hand, freezing a very liquid product too quickly produces small ice crystals that push the active product upwards, which can also denature it.

Pasteurisation

(thermo-controlled debacteriisation) takes its name from Louis Pasteur's work on the stabilisation of wines in the nineteenth century. It was he who discovered it in 1865. It refers to a heat treatment that destroys, more or less completely, microbial elements in their vegetative form.

In reality, pasteurization is sometimes carried out in conditions that certainly eliminate pathogenic microorganisms (*Staphylococcus*, *Salmonella,* etc.) but not necessarily all vegetative forms: some, heat-resistant, can survive alongside spore-forming forms. The thermo-resistance of certain elements depends on the environment in which pasteurization is carried out. The more acidic the medium, the lower the heat resistance. For example, in a fruit juice with a pH below 4.5, all microorganisms will be destroyed while for a product with a pH above 4.5 (meat products), microorganisms resistant to more than 100°C will not be destroyed. In this case, we are talking about semi-canned goods.

Pasteurization was initially generally carried out at temperatures below 100°C, but it has evolved towards a decrease in time and a rise in temperature. It is used to destroy bacteria in food without changing its composition, flavour or nutritional value. It applies in various cases: milk, vinegar, fruit juice, etc. A pasteurised element must be packaged in a waterproof package and kept cold (+4°C) to prevent the multiplication of bacteria that have not been destroyed. For the preservation of vitamins, this process is the least aggressive of the thermal techniques.