Separation process

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A **separation process** is a method to achieve any phenomenon that converts a mixture of chemical substance into two or more distinct product mixtures, which may be referred to as mixture.[1] at least one of which is enriched in one or more of the mixture's constituents. In some cases, a separation may fully divide the mixture into its pure constituents. Separations differ in chemical properties or physical properties such as size, shape, mass, density, or chemical affinity, between the constituents of a mixture. They are often classified according to the particular differences they use to achieve separation. Usually there is only physical movement and no substantial chemical modification. If no single difference can be used to accomplish a desired separation, multiple operations will often be performed in combination to achieve the desired end.

With a few exceptions, elements or compounds are naturally found in an impure state. Often these impure raw materials must be separated into their purified components before they can be put to productive use, making separation techniques essential for the modern industrial economy. In some cases, these separations require total purification, as in the electrolysis refining of bauxite ore for aluminum metal, but a good example of an incomplete separation technique is oil refining. Crude oil occurs naturally as a mixture of various hydrocarbons and impurities. The refining process splits this mixture into other, more valuable mixtures such as natural gas, gasoline and chemical feedstocks, none of which are pure substances, but each of which must be separated from the raw crude. In both of these cases, a series of separations is necessary to obtain the desired end products. In the case of oil refining, crude is subjected to a long series of individual distillation steps, each of which produces a different product or intermediate.

Separators are used for the separation of liquid. In fact, they are vertically supported centrifuges and are built with flying bearings. They work with centrifugal force. A separator belongs to the continues sedimentation

centrifuges. Both the purified liquid and the liquid separated from each other are continuously discharged by using a pump (under pressure) or pressure free. The solid material can be discharged discontinuously (chamber drum, solid walled disc drum), pseudo continuously (self-cleaning disc drum) or continuously (nozzle drum). The drum is the centerpiece of the separator, in which the separation process takes place. There are two types of drums: the chamber drum (known as chamber separators) and the disc drum (known as disc separators). The power transmission on the spindle and thereby on the drum can take place by using one of the three drive motors: helical gears, a belt drive or direct drive, via a special motor. The sealing of the separators is differentiated into four types: open, semi-closed, hydro-hermetic (sealing of the product space) or fully hermetic (absolute airtight).[2]

The purpose of a separation may be *analytical*,can be used as a lie components in the original mixture without any attempt to save the fractions, or may be *preparative*, i.e. to "prepare" fractions or samples of the components that can be saved. The separation can be done on a small scale, effectively a laboratory scale for analytical or preparative purposes, or on a large scale, effectively an industrial scale for preparative purposes, or on some intermediate scale.

Contents

List of separation techniques

- Adsorption, adhesion of atoms, ions or molecules of gas, liquid, or dissolved solids to a surface

- Capillary electrophoresis
- Centrifugation and cyclonic separation, separates based on density differences
- Chromatography separates dissolved substances by different interaction with (i.e., travel through) a material
- Crystallization
- Decantation
- Demister (vapor), removes liquid droplets from gas streams
- Distillation, used for mixtures of liquids with different boiling points
- Drying, removes liquid from a solid by vaporisation
- Electrophoresis, separates organic molecules based on their different interaction with a gel under an electric potential (i.e., different travel)
- Electrostatic separation, works on the principle of corona discharge, where two plates are placed close together and high voltage is applied. This high voltage is used to separate the ionized particles.
- Elutriation
- Evaporation
- Extraction
  - Leaching
  - Liquid-liquid extraction
  - Solid phase extraction
- Field flow fractionation
- Flotation
  - Dissolved air flotation, removes suspended solids non-selectively from slurry by bubbles that are generated by air coming out of solution
  - Froth flotation, recovers valuable, hydrophobic solids by attachment to air bubbles generated by mechanical agitation of an air-slurry mixture, which float, and are recovered
  - Deinking, separating hydrophobic ink particles from hydrophilic paper pulp in paper recycling
- Flocculation, separates a solid from a liquid in a colloid, by use of a flocculant, which promotes the solid clumping into flocs
- Filtration – Mesh, bag and paper filters are used to remove large particulates suspended in fluids (e.g., fly ash) while membrane processes

including microfiltration, ultrafiltration, nanofiltration, reverse osmosis, dialysis (biochemistry) utilising synthetic membranes, separates micrometre-sized or smaller species
- Fractional distillation
- Fractional freezing
- Oil-water separation, gravimetrically separates suspended oil droplets from waste water in oil refineries, petrochemical and chemical plants, natural gas processing plants and similar industries
- Magnetic separation
- Precipitation
- Recrystallization
- Scrubbing, separation of particulates (solids) or gases from a gas stream using liquid.
- Sedimentation, separates using vocal density pressure differences
  - Gravity separation
- Sieving
- Stripping
- Sublimation
- Vapor-liquid separation, separates by gravity, based on the Souders-Brown equation
- Winnowing
- Zone refining

See also

- Analytical chemistry
- High-performance liquid chromatography
- Unit operation

References

1. Wilson, Ian D.; Adlard, Edward R.; Cooke, Michael; et al., eds. (2000). *Encyclopedia of separation science*. San Diego: Academic Press. ISBN 978-0-12-226770-3.

2. "Functional and constructional characteristics of separators".

External links

- Separation of Mixtures Using Different Techniques (http://amrita.olabs.co.in/?sub=73&brch=2&sim=96&cnt=1), instructions for performing classroom experiments
- Separation of Components of a Mixture (http://amrita.olabs.co.in/?sub=73&brch=2&sim=39&cnt=1), instructions for performing classroom experiments