

# Analytical Separations

Analytical separations occur on a much smaller laboratory scale than the industrial-scale separations.

For most analyses, we must consider how to treat foreign species that attenuate the signal from the analyte or produce a signal that is indistinguishable from that of the analyte.

A substance that affects an analytical signal or the background is called an **interference** or an **interferent**.



- Separations isolate the analyte from potentially interfering constituents.
- Separations can be complete or partial.
- In the separation process, material is transported while its components are spatially redistributed.
- A separation always requires energy because the reverse process, mixing at constant volume, is spontaneous, being accompanied by an increase in entropy.
- Separations can be preparative or analytical.



# SEPARATION METHODS

Naturally homogeneous and heterogeneous mixtures are separated by different methods.

At the core of all these methods lies the idea of "**creating two phases**" and then separating these phases from each other by mechanical techniques.



# Separation Methods for Heterogeneous Mixtures

Separation of heterogeneous mixtures can be accomplished by physically withdrawing one of the different phases from the other phase

- Solid-solid
- Solid-liquid
- Liquid-liquid

Binary heterogeneous mixtures will be discussed.



# Solid-Solid Heterogeneous Mixtures

A special feature of the solids (**particle size**, **magnetism**, etc.) is utilized in separation processes.



# Solid-Liquid Heterogeneous Mixtures

In chemistry laboratories, the precipitates, which often have very small particle structure as the solid phase, are separated from a liquid.

If an insoluble solid is formed as a result of the addition of a particular chemical (or a second solution) to a solution, then a **solid-liquid heterogeneous mixture** is referred to.

This process is called **precipitation**

The substance that leaves the medium as small particles is called **precipitate**.



# A Precipitate That Is

- easily filtered and washed free of contaminants;
- of sufficiently low solubility that no significant loss of the analyte occurs during filtration and washing;
- unreactive with constituents of the atmosphere;
- of known chemical composition after it is dried or, if necessary, ignited

