



CHEM 551

Chemical Separation and Chromatographic Methods



Why We Need Separation Methods ?

- For analysis of a substance in presence of other components (matrix).
- To separate the components of a mixture for more advanced use (purification).

Theory of Separation Methods

The goal of an analytical separation is to remove either the analyte or the interferent from the sample matrix.

To achieve a separation there must be at least one significant difference between the chemical or physical properties of the analyte and interferent.

e.g., solubility, volatility, adsorption, boiling point, melting point, ion exchange, molecular size.

Distinction between Separation and Purification

In the case of **purification** the starting material consists mainly of one compound, and the small amounts of other compounds (contaminants) must be removed to get the main component as a pure entity.

On the other hand in **separation** one would need to isolate several, or all, of the compounds in the pure state or an essentially pure state, from the starting material in which each of these compounds was present in significant amount.

Classifying Separation Techniques

- Traditional Methods of Separation and Purification
Methods of Everyday Use
- Instrumental Methods of Separation and Purification

Classifying Separation Techniques

Basis of Separation	Separation Technique
size	filtration dialysis size-exclusion
mass and density	centrifugation
complex formation	masking
change in physical state	distillation sublimation recrystallization
change in chemical state	precipitation ion exchange electrodeposition volatilization
partitioning between phases	extraction chromatography

Choice of the Appropriate Technique

The choice of the appropriate method mainly depends on the physico-chemical properties of the analyte and of the matrix as well as the objectives of the overall method.

- Physical state (solid, liquid, gas),
- Chemical structure,
- Functional group,
- Polarity,
- Solubility,
- Volatility,
- Charge,
- Stability,
- Detection technique.

A combination of more than one separation or purification method may have to be used at times.

Separation Versus Preconcentration

- Two frequently encountered analytical problems are:
 - (1) the presence of matrix components interfering with the analysis of the analyte.
 - (2) the presence of analytes at concentrations too small to
 - analyze accurately.
- **Preconcentration** is the process of increasing an analyte's
 - concentration before its analysis.



Thank You!

