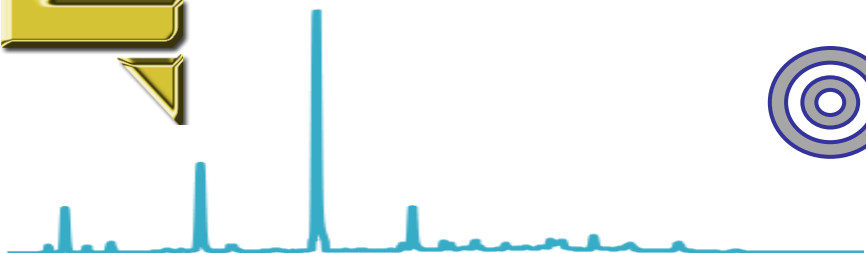
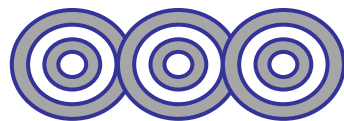


# Chem 651

## Advanced Studies in Instrumental Analysis



**Ahmad Aqel Ifseisi**

Professor of Analytical Chemistry  
College of Science, Department of Chemistry  
King Saud University

P.O. Box 2455 Riyadh 11451 Saudi Arabia  
Building: 05, Office: 2A149, Lab: 2A127  
Tel. 014674198, Fax: 014675992

Web site: <http://fac.ksu.edu.sa/aifseisi>

E-mail: [ahmad3qel@gmail.com](mailto:ahmad3qel@gmail.com)  
[aifseisi@ksu.edu.sa](mailto:aifseisi@ksu.edu.sa)



# 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.

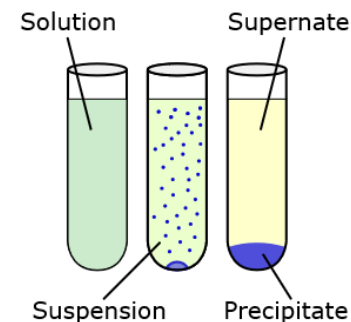
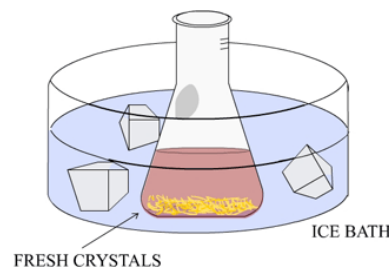
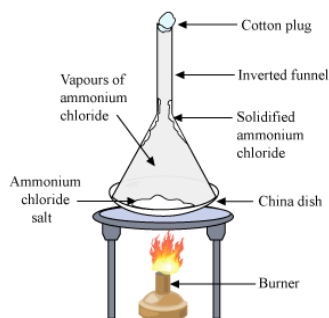
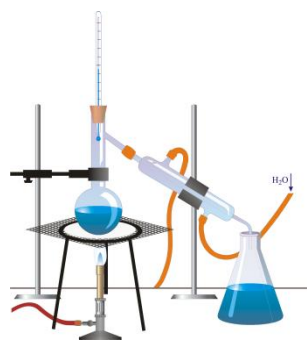
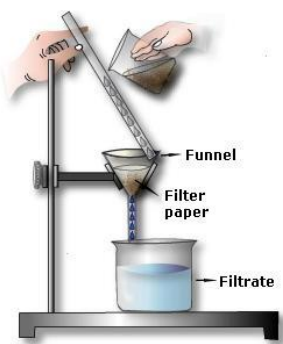


# Classifying Separation Techniques

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

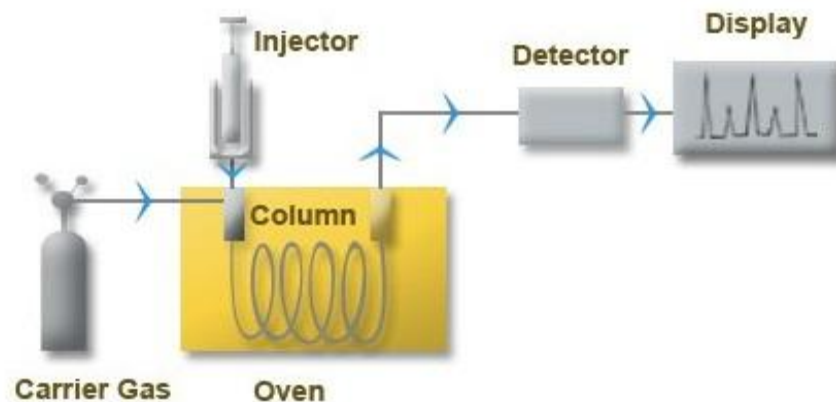
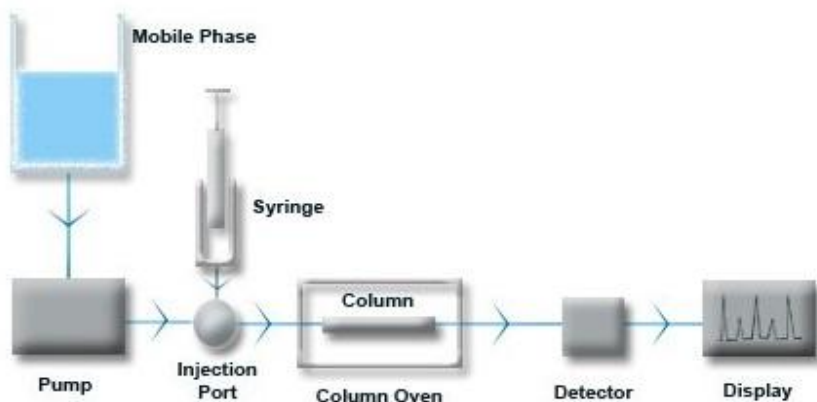
# Classifying Separation Techniques

## - Traditional Methods of Separation and Purification



Methods of everyday use

## - Instrumental Methods of Separation and Purification



# 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.

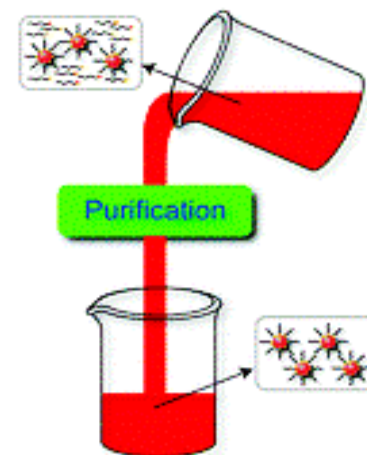
- Physical state (solid, liquid, gas),
- Chemical structure,
- Functional group,
- Polarity,
- Size and molecular weight,
- Solubility,
- Volatility,
- Charge,
- Stability,
- Detection technique.



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

# Separation vs. 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.

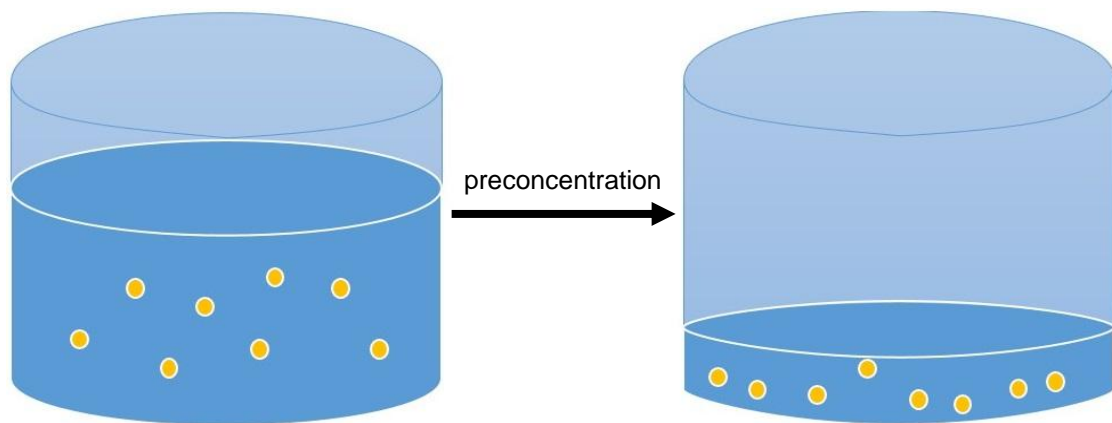


In **separation**, one would need to isolate several, or all, of the compounds in the pure state or an essentially pure state, from the starting material in which each of these compounds was present in significant amount.



# Separation vs. 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.

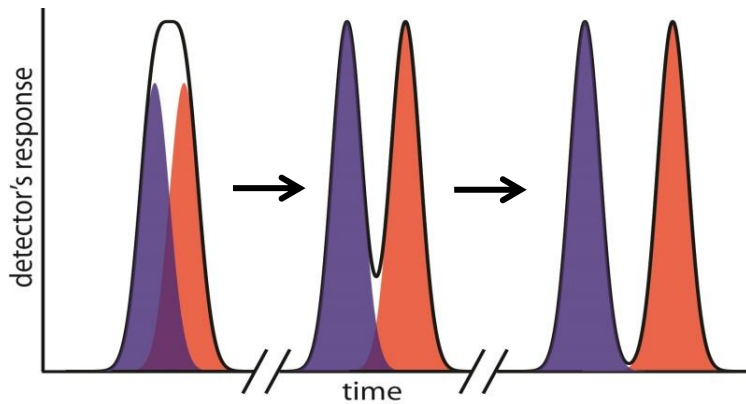


**Preconcentration** is the process of increasing an analyte's concentration before its analysis.

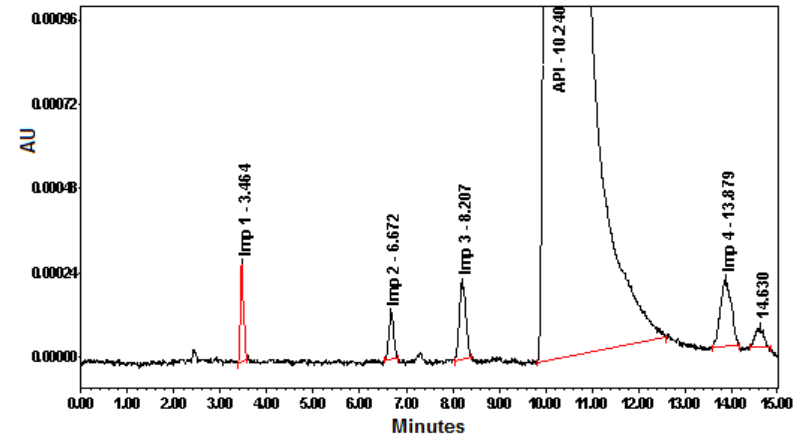


# Separation vs. Purification vs. Preconcentration

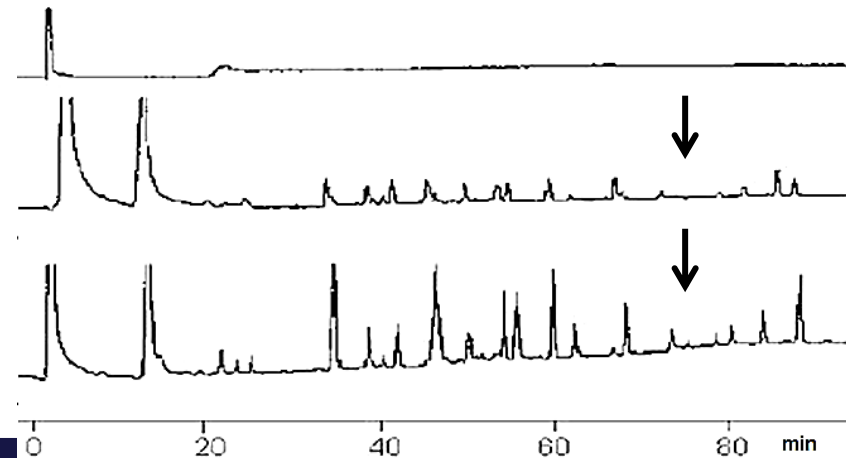
In the case of **purification** the starting material consists mainly of one compound, and the small amounts of other compounds (contaminants) must be removed to get the main component as a pure entity.



The presence of analytes at concentrations too small to analyze accurately is frequently encountered analytical problem. **Preconcentration** is the process of increasing an analyte's concentration before its analysis.



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.



Thank You!

