

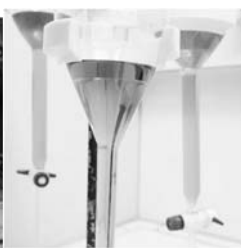
Chapter 6. Introduction to Spectrometric methods

Classification of Analytical Methods

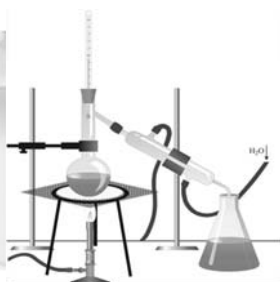
- Classical Analysis
 - Wet-chemical methods
 - Separation of component of interest (analyte) from the sample by precipitation, extraction, or distillation
 - Gravimetric or titrimetric measurement for quantitative analysis
- Instrumental Analysis
 - Use of new methods for quantitative analysis



precipitation



extraction



distillation



Instrumental Analysis

Select an Analytical Method

- What accuracy is required *정확한 데이터를 요구하는가? 화성에서 시료를 가져온다면?*
- How much sample is available *시료의 양. 중요!! 대부분의 bio 물질들은 양이 한정적임*
- What is the concentration range of the analyte *시료의 농도. 나에게 주어진*
- What components of the sample will cause interference *구성 성분이 100% 분석되지는 않음*
- What are the physical and chemical properties of the sample matrix *물리·화학적 성질은 어떠한가*
- How many samples are to be analyzed *몇 개의 시료를 분석해야 하는가? 많으면 개고생*

Introduction to Spectrometric methods

- What is spectroscopy?
 - Interaction of Electromagnetic Radiation (or wave) with Matter
 - (now includes acoustic wave, ion, electron particles) *↓ 광화학*
 - Atomic and Molecular spectroscopy *원자나 분자나에 따라 공통점·차이점 존재*
- What is spectrometry? *빛의 세기를 바탕으로 양이나 질량을 판단*
The measurement of the intensity of radiation with a photoelectric transducer or other type of electronic device. *저시광선 지니이션. 적외선 어떻게 구분해서 관찰할 것인가.*
- What is spectrometric method?
Analytical methods based on spectroscopy

- Atomic spectroscopy

Atomic absorption

Atomic fluorescence / emission

Atomic mass

Atomic X-ray

Surface Characterization

- Molecular spectroscopy

UV-Vis absorption

Luminescence

IR

Raman

NMR

Molecular mass

Surface Characterization

Atomic Absorption

- No vibrational or rotational energy levels
 ↳ sharp line spectra with few features
 ↳ Electronic transition only
- For example: Na atom
 - Na 3s - 3p 589.0, 589.6 nm (yellow)
 - Na 3s - 5p 285.0, 285.1 nm (UV)
- Energy and photons
 - Visible enough energy for valence (bonding) excitations
 - UV and x-ray enough energy for core (inner) excitations

Molecular Absorption

- Electronic, vibrational and rotational energy levels

– broad band spectra with many features

□ $\Delta E = \Delta E_{\text{ele}} + \Delta E_{\text{vib}} + \Delta E_{\text{rot}}$

– For each electronic state – many vibrational states

– For each vibrational state – many rotational states

- Absorption spectra affected by

– (1) number of atoms in molecule

– (2) solvents

