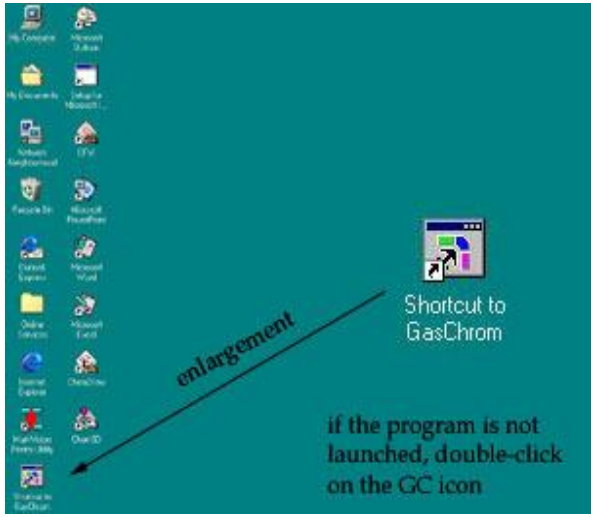
GAS CHROMATOGRAPHY (GC)



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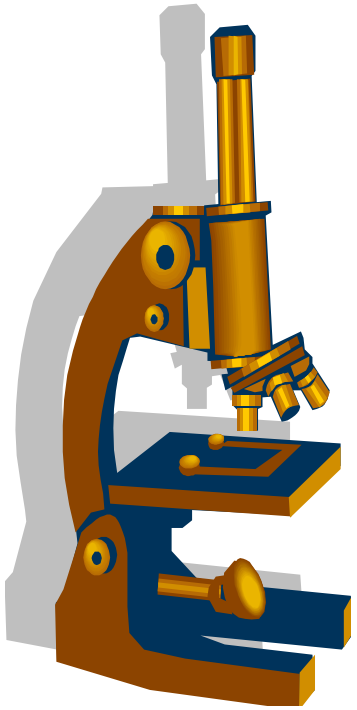
Basic Competencies:
Students can describe the separation of GC, interpretation chromatograms, and apply this separation method for the analysis of a sample

USAGE GC

- The oil (petroleum)
- The field of essential oils
- The field of medicine
- Chemistry / research
- Pesticide
- Environment / pollution



BENEFITS OF USE GC

- Fast
- Operation is simple
- Sensitive (order of ppm, ppt), mL, mg
- The separation (resolution) high
- Qualitative and quantitative analysis
- High repeatability

ANALYSIS OF CHROMATOGRAPHY

- GAS-LIQUID: PARTITION
- GAS-SOLID: ADSORPTION
- Qualitative analysis: based on chromatogram peak that appears
- Quantitative analysis: a high peak areas or peak chromatogram

Gas-Solid Chromatography (GSC)

- Mobile phase: gas
- Stationary phase: non-volatile solids , stable

  For example: spheron (Grafite-coal), linden (molecular sieves) porapak, polypak, chromosorb
- Basic work: the separation of molecules based on size

Gas-Liquid Chromatography (GLC)

- Terms of the solid support:
  1. Stable at high temperatures
  2. Inert, not reacting with samples & stationary phase
  3. The large surface area (grain)
  4. Ideal situation (same size)
- Examples of solid support:
  Diatoport, cilite, chromosorb (G, P, W)
- Working basis:
  separation based on partition between mobile phase and stationary phase

Gas-Liquid Chromatography (GLC)

- Mobile phase: gas
- Stationary phases: liquid, the condition:
  1. Non volatile
  2. Inert & stable
  3. Very viscous
  4. Spread & bound to a solid support
  5. Soluble in organic solvent (ether)

Gas-Liquid Chromatography (GLC)

- This type of stationary phase: polar, semi polar, non polar
- Examples of polar stationary phases:
  carbowax 20M, PEGA, DEGS, castorwax, amine 220, versamid 900, PDEAS
- Examples of semipolar stationary phases:
  dionilftalat, SE-52 (OV-17)
- Examples of non-polar stationary phases:
  apiezon, Squalane, SE-30

Classification of compounds

POLAR

- water
- Glycol, glycerol
- alcohol
- Oksim
- Hydroxy acids
- ester
- etc.

Classification of compounds

SEMI POLAR

ether
ketone
aldehyde
tertiary amine
etc.

- NON POLAR
  CHCl3
  CH2Cl2
  aromatic hydrocarbons
  olefin hydrocarbons
  CH3CHCl2
  etc.

BASIC SEPARATION

Rule: like dissolves like

Compounds	**Stationary Phase**	nature
Polar	Polar	Soluble
Non polar	Non polar	Soluble
Polar	Non polar	**insoluble**
Non polar	Polar	**insoluble**

CHROMATOGRAM

- GAUSS CURVE
  1. Eddy diffusion and molecular
  2. The balance of slow
  3. Price K is not fixed

- IDEAL chromatogram
  1. Quickly balance
  2. No diffusion
  3. uniform column

INSTRUMENTS GC

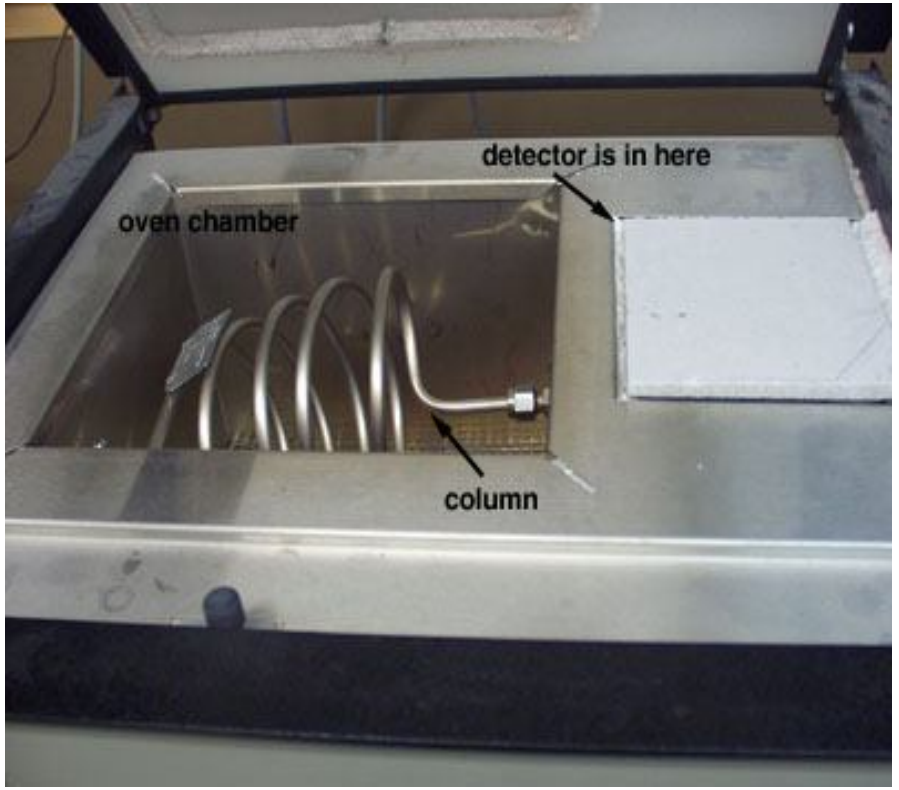
COMPONENTS INSTRUMENTS GC

- Carrier gas tank (+ regulator)
- Place the sample injection
- column
- detector
- Amplifier + Recorder

Carrier gas tank (+ regulator)

Place the sample injection

column



Detector

- FID
- TCD
- FPD
- ECD

FID Detector

- **Basic work:** sample + burner gas (H2 + air/O2) burned ⟶ Ionization occurs: positive ion to negative electrode, negative ion to positive electrode
- On electrodes occurs: Change Voltage (V) Change of voltage forwarded to the recorder and produce chromatogram.
- **Advantages:** highly sensitive (1000xTCD).
- **Disadvantages:** damaged samples, detecting water insoluble, CS2, O2, N2, CO2, and the noble gases.

TCD Detector /Chatarometer

- **Conditions:** the temperature of the detector must be higher than column temperature
- **Basic principles:** Components which have been separated from the column carried by the carrier gas on the filament. Change of filament temperature causes filament resistance . Resistance filaments changed by Wheatstone bridge become current . Change current arus forwarded to the recorder and then converted become chromatogram.

TCD Detector /Chatarometer

- **Advantages:**
  1. Does not destroy the sample
  2. All kinds of compounds can be detected.

- **Disadvantage:**

  less sensitive.