

# Principle of chromatography

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# Objectives

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- ✓ **Identifying the components of the chromatography.**
- ✓ **Understanding the basic principles of chromatography.**
- ✓ **Identifying the chromatography to be used in the experiment.**

- Reference

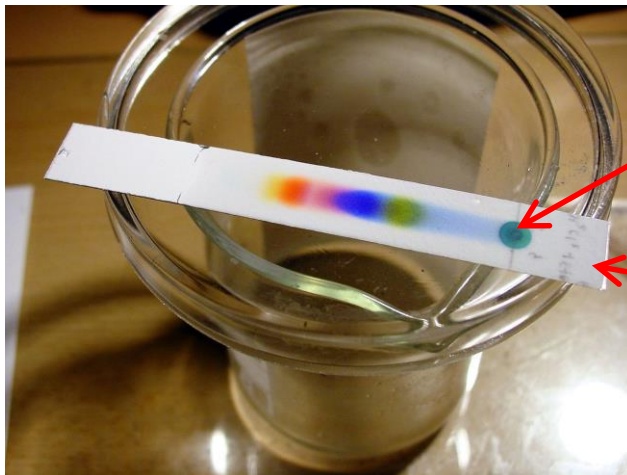
Principles of instrumental analysis (Skoog, Holler, Nieman)

# Chromatography

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## ❖ Chromatography

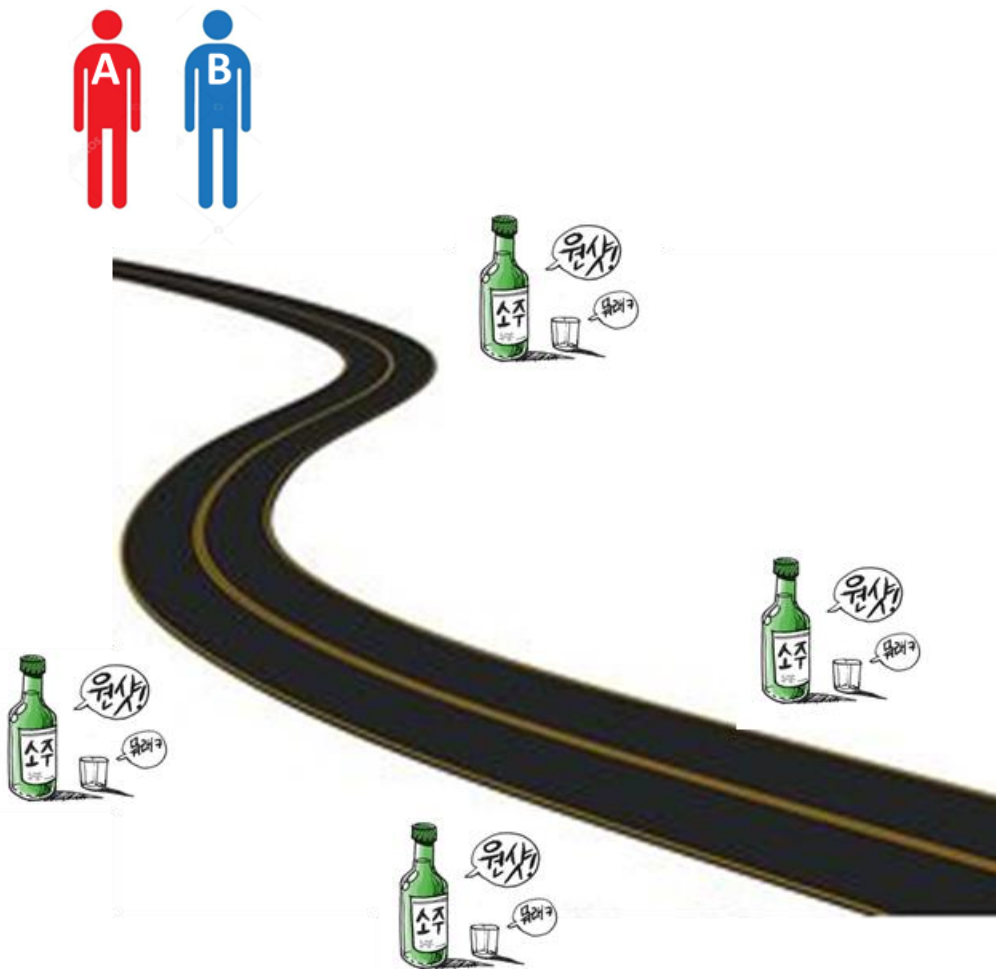
- One of the experimental techniques to separate the mixture. It can be used for separating purpose but in this experiment it is used for quantification.
- ✓ Stationary phase  
: Solid particles or liquids used to separate materials such as columns, paper, thin films, etc.
- ✓ Mobile phase  
: Fluid flowing through the stationary phase of chromatography



Mobile Phase: water

Stationary phase: paper

# Principle of chromatography



A: alcoholphilic student

B: alcoholphobic student

Student<sub>(mobile phase)</sub> is moving from  
Seoul<sub>(Injector)</sub> to Busan<sub>(Detector)</sub>

But lot's of famous Pub<sub>(Stationary phase)</sub> was on the way to Busan

→ A is alcoholphilic and needs longer  
time to reach Busan

If the *analysis conditions are the same*, the *same material takes the same time* from the injector to the detector.

→ **Retention Time**

# Types of chromatography

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- ✓ Gas Chromatography: mobile phase is gas
- ✓ Liquid Chromatography: mobile phase is liquid
- ✓ Supercritical Fluid Chromatography: mobile phase is supercritical fluid

- **Gas Chromatography**

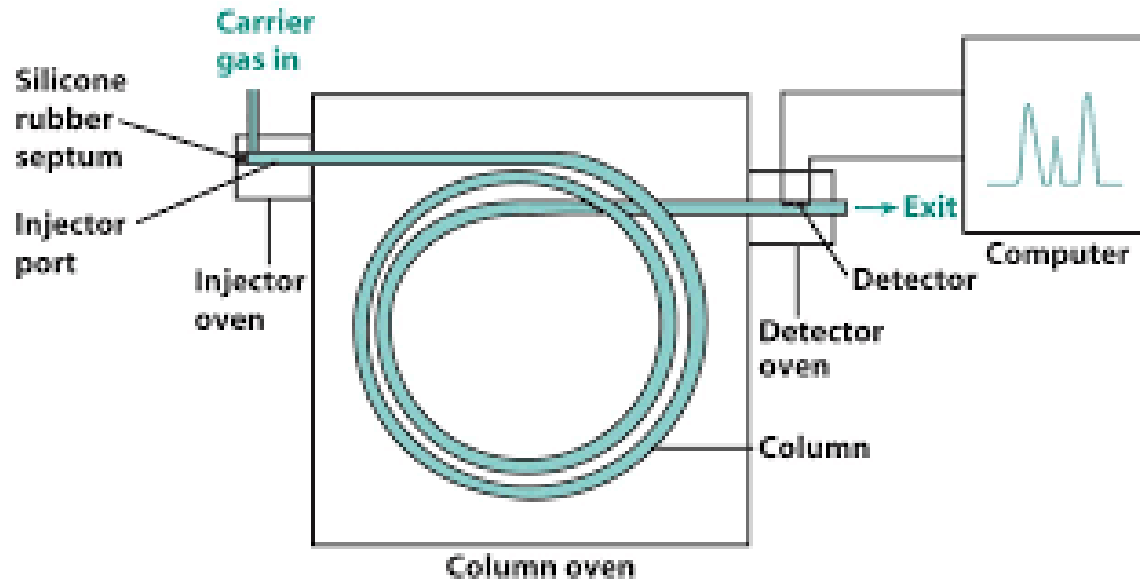
- Samples should be volatile and applied to relatively low molecular weight materials
- Must be stable against heat
- Separation by chemical affinity and boiling point difference between stationary phase and sample (adsorption, distribution)

- **Liquid Chromatography**

- The sample must be well dissolved in the mobile phase, and there is no upper limit of the molecular weight
- Analysis is performed near room temperature, so it can be analyzed even if it is unstable against heat
- Separation by chemical affinity between sample, stationary phase and mobile phase (adsorption, distribution, ion exchange, molecular size exclusion)

# Components of the chromatography

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- ✓ Component: Inlet, column, oven, detector.
- ✓ In this experiment, the mixture is quantified using GC-TCD, GC-FID, and HPLC.
- ✓ FID is 1000 times more sensitive than TCD, but FID can not analyze  $N_2$ ,  $CO_2$ ,  $CH_4$  and  $H_2$ : GC-FID is more sensitive than HPLC The analysis time is short and the resolution is good, but lactic acid is not detectable.

# Effect of analysis condition on the chromatography result

