

Planar chromatography

Planar chromatography is a separation technique in which the stationary phase is present as or on a plane. The solvent moves up the plate by capillary action. There are two types of planar chromatography: thin layer chromatography (TLC) and paper chromatography.

Thin layer chromatography (TLC) is a chromatography technique used to separate mixtures. Thin layer chromatography is performed on a sheet of glass, plastic, or aluminum foil, which is coated with a thin layer of adsorbent material (stationary phase), usually silica gel, or aluminium oxide.

In paper chromatography, Separations in paper chromatography involve the same principles as those in thin layer chromatography. However, the paper is made of cellulose (stationary phase).

The retention factor (R_f) may be defined as the ratio of the distance traveled by the substance to the distance traveled by the solvent. If R_f value of a solution is zero, the solute remains in the stationary phase and thus it is immobile. If R_f value = 1 then the solute travels with the solvent front. To calculate the R_f value, take the distance traveled by the substance divided by the distance traveled by the solvent (mobile phase).

$$R_f = \text{Distance from origin to center of spot} / \text{Distance from origin to solvent front}$$

The factors affect R_f value:

- 1- The nature of the mobile phase.
- 2- The nature of the stationary phase.
- 3- Temperature.

(6): Choose the appropriate mobile phase

The idea of the experiment:

Such series are useful for determining necessary solvents needed for chromatography of chemical compounds. Normally such a series progresses from non-polar solvents, such as n-hexane, to polar solvents such as methanol or water. Characteristics of the appropriate mobile phase:

- 1- Good separation between substances.
- 2- $R_f \neq 1$
- 3- Achieve the desired resolution in an acceptable time.

Materials and tools used:

Thin layer (a sheet of glass coated with silica gel). Substances: Sudan yellow, Bromocresol purple, Bromophenol blue. Mobile phases: (Methanol 2:8 Ethyl acetate), (Methanol 8:2 Ethyl acetate), Benzene 8:2 Ethyl acetate).

Procedure:

- 1- Draw a line (in pencil not pen) across the bottom edge of the plate 1 cm up from the bottom.
- 2- Spot three spots along the line drawn on the plate.
- 3- Pour 10 ml of mobile phase in the jar and leave it few minutes to help to saturate the atmosphere with solvent vapor.
- 4- Put the plate inside the jar.
- 5- Remove the plate and mark the solvent front with a pencil.
- 6- Allow the plate to dry for a few minutes.
- 7- Calculate R_f for each substance.
- 8- Repeat the same steps for the other two phases.
- 9- Compare between the mobile phases, which one is the best?why?