TLC: Thin Layer Chromatography

Most common adsorbents (stationary phase)

SiO_2 or Al_2O_3 (silica or alumina)

Intermolecular forces involved

salt formation > Hydrogen bonding > dipole-dipole > Van der Waals

More polar solutes require more polar solvents for elution, due to stronger interactions with the stationary phase.

Eluotropic Series

Elution strength order for solvents. Mixed solvents may also be used.

Steps in TLC analysis

1. spotting- application of a dilute solution of the sample to the TLC plate
2. development- solvent climbs TLC plate by capillary rise, carrying sample upwards
3. visualization- detection of the sample position on plate, UV or I2 vapors most common

Rf, retention factor ($0 < R_f < 1$) = distance moved by spot/distance moved by solvent front

Theoretical plates, N = 16(distance moved by spot/spot diameter)^2

Errors

1 tanks not dry and/or saturated with solvent vapors-irreproducible R_f values
2 solvent above starting line-samples leached from plate-no spots after development
3. solvent reaches top of plate-bad R_f values
4 sample too concentrated-tailing spots
5 too much sample volume-large, poorly resolved spots
6 spots too close to edge of plate-distorted spots

Applications

1 quick analysis of reaction compositions-nonvolatile compounds only
2 screening solvents for HPLC or column chromatography
3 Study of intermolecular forces
4 forensic analysis, pharmaceuticals, biologicals

Notes

1 very sensitive-microgram (10^{-6} gm) detection
2 can be done quantitatively by measuring spot size and color intensity vs standards
3 can be used preparatively for 0.1-1 gm separations using thicker stationary layer