**TLC: Thin Layer Chromatography**

**Most common adsorbents (stationary phase)**

\[ \text{SiO}_2 \text{ or Al}_2\text{O}_3 \text{ (silica or alumina)} \]

**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 I\(_2\) vapors most common

**R\(_f\), retention factor** \((0 < R_f < 1) = \text{distance moved by spot/distance moved by solvent front}\)

**Theoretical plates** \(N = 16(\text{distance moved by spot}/\text{spot diameter})^2\)

**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 \((10^{-6} \text{ gm})\) 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