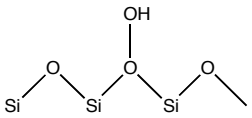
Chem 2219 **TLC: Thin Layer Chromatography**

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.

More polar solutes always move more slowly than nonpolar solutes, regardless of solvent.

Eluotropic Series

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

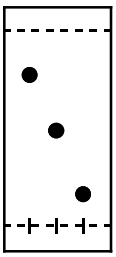
Methanol
Acetone
Ethanol
Ethyl acetate
Dichloromethane
Toluene
Hexane
Petroleum ether
Cyclohexane

Steps in TLC analysis

1. **spotting**- application of a dilute solution (~2-5%) 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 light or I_2 vapors most common



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

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

Errors

1 tanks not dry and/or not saturated with solvent vapors (eg. no watch glass)-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
7 TLC plate touching filter paper-skewed solvent front
8 fingerprint on stationary phase-distorted spots
9 chipped stationary phase-distorted spots
10 pencil cuts through stationary phase-may interrupt solvent development
11 Pencil line not straight and parallel to plate-poor Rf values.

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 sensitive-microgram ,10^{-6} gm, detection
2 quantitation possible by via spot size /color intensity vs standards
3 preparative scale for 0.1-1 gm samples using thicker stationary layer