Tactile Column Chromatography

Background

Chromatography is a technique used to separate or purify mixtures.

Column chromatography involves a liquid **mobile phase** and a solid **stationary phase**.

Components normally interact with the mobile phase and stationary phase via intermolecular interactions.

**Task:** See if you can name the intermolecular interactions and put them in order of strength (A level students only).

Van der waals (weakest)

Dipole – dipole

Hydrogen bond (strongest)

The rate at which each component moves down the column is determined by its relative affinity for the mobile phase and stationary phase.

Mobile phase

Sample



Stationary phase

Separated bands

In **normal phase** column chromatography, the stationary phase is polar and the mobile phase is non-polar. therefore polar components interact more strongly with the stationary phase and move through the column slower.

In **reverse phase** column chromatography, the stationary phase is non-polar and the mobile phase is polar. therefore non-polar components interact more strongly with the stationary phase and move through the column slower.



Normal phase chromatography Reverse phase chromatography

### Silica

Silica (SiO2) is a common stationary phase. You can find silica in sand on the beach. But the silica in columns is a bit different. It has lots of holes in it, called pores. The surface of all those holes is covered in Si-OH groups. We call these silanol groups. The holes give the silica a really high surface area. This means lots of space for polar molecules to stick to!



**The tactile model**

The tactile model can be used to illustrate the way in which column chromatography works. The plastic and wool felt balls represent the components in the mixture and the Velcro inside the column represents the stationary phase.

Task: Pour the balls down the column and feel which balls come out.

A picture containing indoor

Description automatically generated

Question 1: Why did the balls separate in the column

The wool felt balls stick to the columns’ Velcro interior better than the plastic balls.

Question 2: Relate this back to standard chromatography

In standard chromatography, separation is due to the difference in the affinity between each component and the stationary phase. In this model the balls represent the components and the Velcro represents the stationary phase. The separation between the balls is determined by each of their interactions with the Velcro.