

Column chromatography

Column chromatography is a form of liquid chromatography. It's a method designed to separate different chemical compounds in a solution due to their different physical attributes such as polarity. A column for chromatography is usually divided into a stationary phase and a mobile phase. The stationary phase normally consists of silica gel, whereas the mobile phase is a solvent or a mixture of solvents. Which solvent or rather mixture of solvents is used as mobile phase depends on the compounds one intends to separate. The various compounds in the solution differ in their polarity, which varies the time they interact with the stationary phase. Therefore, some compounds remain longer in the column than others, which allows to separate the components.

Materials

Column: Glascolumn, approx. 5 cm \varnothing

Stationary Phase: silica gel

Mobile Phase: EtOAc:MeOH:Petrolether (10:1:2)

Procedure

First, a small piece of cotton is placed at the valve before filling the column with silica gel to determine the amount needed for the fractionation. Commonly, at least two thirds of the column are filled with the silica gel. Subsequently, the silica gel is removed from the column and dissolved in a small part of the solvent used for the chromatography. After all silica gel is dissolved, it's carefully filled back in the column. During the process, it's important to avoid the occurrence of bubbles or contaminations. The silica gel is soaked with the solvent mixture. Afterwards, the chemical solution is added onto the silica gel. After applying the solution, the silica gel is covered with a small portion of sand to avoid reslurrying the sample when the solvent is added to the column. For an example of the column set-up, see figure 1. During the fractionation, the column needs to be fully covered with the solvent to prevent it from running dry, which would disturb the separation of the components. The solvent that is drained from the valve is collected in small vials with a capacity of 50 mL. The fractions are later analysed to determine which contain the desired component.

The Chromatography Column

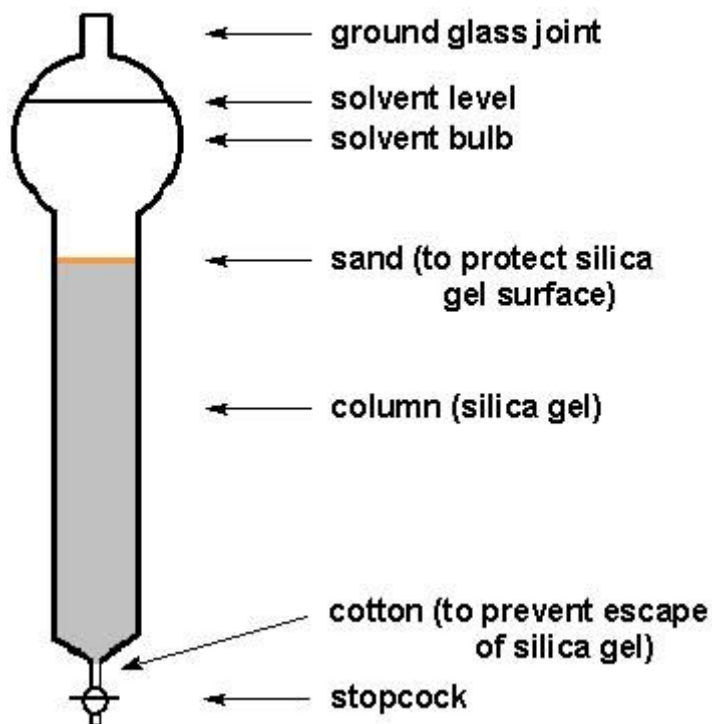


Figure 1: schematic representation of the setup for liquid column chromatography^[1]

Trouble shooting

The main problem during liquid chromatography is determining the optimal solvent mixture to separate the compounds of one chemical solution. The optimal composition of solvents is determined via thin-layer chromatography.

References

[1] <http://www.chem.ucla.edu/~bacher/General/30BL/tips/column.jpg>