

Gas Chromatography

In a Gas Chromatography analysis, a known volume of gaseous or liquid **analyte** is injected into the entrance of the column, usually using a microsyringe. As the carrier gas or **mobile phase**, sweeps the analyte molecules through the column, this motion is inhibited by the adsorption of the analyte molecules either onto the column walls or onto packing materials in the column (**stationary phase**). The rate at which the molecules progress along the column depends on the strength of this interaction, which in turn depends on the type of molecule and on the stationary phase materials. Since each type of molecule has a different rate of progression, the various components of the analyte mixture are separated as they progress along the column and reach the end of the column at different times. A detector is used to monitor the outlet stream from the column; thus, the time at which each component reaches the outlet (retention time). Generally, substances are identified (qualitatively) by the order in which they emerge (elute) from the column and by the retention time of the analyte in the column.

Figure 1 depicts the separation of a two-component mixture using a typical gas column chromatography apparatus. The mobile phase sweeps the mixture into a chromatography column containing the stationary phase. As the two components are pushed through the column by the mobile phase, they are slowed in their progress by their attraction to the stationary phase. One analyte, represented by dark circles, interacts less strongly with the stationary phase and is delayed less, while the other (open circles) interacts more strongly with the stationary phase and lags behind. As a result, the two analytes come out or **elute** from the column at different times.

Results of gas chromatographic analysis are presented in a plot known as a **chromatogram**. The horizontal axis is in units of time. As each compound **elutes** from the column and is detected, it produces a peak in the chromatogram at the corresponding time. The position of the center of the peak, as read on the time axis, is the **retention time** for the component, and is a reproducible value particular to the molecule when analysis conditions are constant. The quantity of analyte injected for analysis does not affect the retention time for the component.

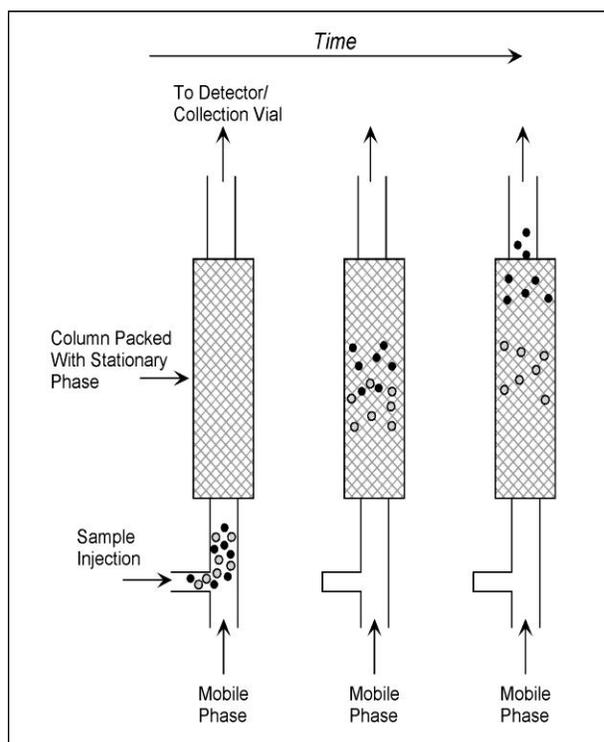


Figure 1 Gas Column Chromatography. A two-component mixture is injected into the flowing mobile phase (He gas) heated to and is swept into a chromatography column containing the stationary phase. Because the \circ molecules interact more strongly with the stationary phase than do the \bullet ones, they lag behind. As more mobile phase is pumped through the column, the two components are eventually separated and removed from the column.