Technical Note

Gas Chromatography a Simple Guide

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What is gas chromatography?

Gas chromatography (GC) is a type of chromatography that analyses volatile compounds.

Gas chromatography uses an inert gas such as nitrogen or helium as the mobile phase and the stationary phase is contained in a column which is found inside an oven within the instrument.

How does gas chromatography work?

Gas chromatography typically works by dissolving a sample in a solvent and then vaporizing the sample in order to be able to separate the analyte. Gas chromatography can only be used to separate semi-volatile or volatile analytes.

After the sample is vaporized it is carried through the column (stationary phase) by an inert gas such as helium or nitrogen. Different molecules within the sample interact differently with the stationary phase, which causes them to travel through the column at different rates.

After the separated compounds have eluted from the column they enter the detector, such as a flame ionization detector (FID) or a mass spectrometer (MS). See our guides on MS and FID on our website for more information.

After the sample has been through the detector a chromatogram is produced. The chromatogram will show different peaks for each different component in the sample – the size of each peak indicates the amount of the component in the sample. Where the peak appears on the chromatogram indicates the retention time of the compound.

How accurate is gas chromatography?

GC is a very accurate and reliable technique for identifying compounds – this is because the results are based on the properties of the analyte and therefore results can be easily replicated.

Is gas chromatography qualitative or quantitative?

Gas chromatography can be used for both qualitative and quantitative analysis.

How does gas chromatography determine concentration?

The peak area of a compound is directly proportional to the amount that is present within the sample however, this only represents the instrument response and not the concentration.

There are different methods we can use in order to determine analyte concentration. A simple example is using an analytical reference material of the target analyte(s) to prepare a single point standard.

This standard, containing known concentrations of the target analytes is then used to calculate the unknown concentrations of the target analytes present within samples.

Sample preparation and changes in the performance of the instrument can lead to variation in results. One way to combat this is the internal standard method, this is where each sample is spiked with a chemical substance of a known concentration.

Results are calculated not by using the peak area of the target analyte but by using the peak area ratio which is calculated as follows:

Peak Area Ratio = "Peak area of analyte" /"Peak area of IS"

See our comprehensive guide on internal standards for more information.