



## A Brief Note on Gas Chromatography

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### Editorial Note

Gas Chromatography (GC) is a type of analytical technique that is used to separate and analyze chemicals that may be vaporized without breakdown. Gas Chromatography is commonly used to determine the purity of a chemical or to separate the various components of a mixture. Gas Chromatography can be used to separate pure substances from a mixture in preparative chromatography.

Vapor Phase Chromatography (VPC) or Gas Liquid Partition Chromatography are other terms for gas chromatography (GLPC). In scientific literature, these alternate names, as well as their related acronyms, are commonly used. The technique of separating compounds in a mixture by injecting a gaseous or liquid sample into a mobile phase, commonly referred to as the carrier gas, and passing the gas through a stationary phase is known as gas chromatography. In most cases, the mobile phase is an inert or non-reactive gas like helium, argon, nitrogen, or hydrogen.

The stationary phase is a microscopic layer of viscous liquid on a solid particle surface on an inert solid support inside a column, which is made of glass or metal tubing. In some columns, the stationary phase may be the surface of solid particles. The gas phase travels *via* a glass or metal column that is housed in an oven where the gas temperature may be adjusted and the eluent exiting the column is monitored by a computerized detector.

A gas chromatography consists of a thin tube, known as the column, through which the vaporized sample passes while being pushed along by a steady stream of inert or nonreactive gas. Components of the sample flow through the column at varying rates, based on their chemical and physical properties and the ensuing interactions with the stationary phase, which is the column lining or filling. In most cases, the column is encased within a temperature-controlled oven. The compounds are recognized and identified electronically as they exit the column's end.

Erika Cremer, a German physical chemist, and Fritz Prior, an Austrian graduate student, developed the first gas chromatograph in 1947, which consisted of a carrier gas, a column packed with silica gel, and a thermal conductivity detector. The chromatograph was displayed atACHEMA in Frankfurt, but no one was interested. The Burrell Corporation's N.C. Turner introduced a large instrument in 1943 that used a charcoal column and mercury vapours.

Uppsala University's Stig Claesson reported his work on a charcoal column that also employed mercury in 1946. While a professor at the University of Marburg, Gerhard Hesse decided to put the widely held belief among German chemists that molecules could not be separated in a flowing gas stream to the test. Using nitrogen as the carrier gas, he effectively separated bromine and iodine using a simple glass column loaded with starch. He subsequently created a device that eluted fractions by passing an inert gas through a glass condenser packed with silica gel.

Oxford University's Courtenay S.G Phillips used a thermal conductivity detector to test separation in a charcoal column. He consulted with Claesson and decided to use displacement as his separating principle. He moved to partition chromatography after hearing about James and Martin's findings.

The Flame Ionisation Detector (FID) and the Thermal Conductivity Detector (TCD) are two often used detectors. While TCDs have the advantage of being non-destructive, their low detection limit for most analytes prevents them from being widely used. FIDs are primarily sensitive to hydrocarbons, and they are more sensitive than TCD. FIDs are suited for environmental organic analyte analysis since they cannot detect water or carbon dioxide. When it comes to analyte detection, flame ionisation detector is two to three times more sensitive than TCD.