



Standard Practice for Gas Chromatography Terms and Relationships¹

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This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This practice covers primarily the terms and relationships used in gas elution chromatography. However, most of the terms should also apply to other kinds of gas chromatography and are also valid in the various liquid column chromatographic techniques, although at this time they are not standardized for the latter usage.

2. Names of Techniques

2.1 *Gas Chromatography*, abbreviated as GC, comprises all chromatographic methods in which the moving phase is gaseous. The stationary phase may be either a dry granular solid or a liquid supported by the granules or by the wall of the column, or both. Separation is achieved by differences in the distribution of the components of a sample between the mobile and stationary phases, causing them to move through the column at different rates and from it at different times. In this recommended practice gas elution chromatography is implied.

2.2 *Gas-Liquid Chromatography*, abbreviated as GLC, utilizes a liquid as the stationary phase, which acts as a solvent for the sample components.

2.3 *Gas-Solid Chromatography*, abbreviated as GSC, utilizes an active solid (adsorbent) as the stationary phase.

2.4 *Gas Elution Chromatography* utilizes a continuous inert gas flow as the carrier gas and the sample is introduced as a gas or a liquid with a finite volume into the carrier gas stream. If the sample is introduced as a liquid, it is vaporized in the system prior to or during passage through the separation column.

2.5 *Gas-Frontal Chromatography* is a technique in which a continuous stream of carrier gas mixed with sample vapor is instantaneously replaced by a continuous stream of carrier gas containing sample vapor at a different concentration. The concentration profile is therefore step-shaped at the column inlet.

2.6 *Gas-Displacement Chromatography* employs a desorbent as the carrier gas or in the carrier gas to displace a less strongly held solute from the stationary phase which in turn displaces the next less strongly held one etc., causing the components to emerge in the normal order, that is, least-to-most strongly absorbed.

2.7 *Isothermal Gas Chromatography* is the version of the technique in which the column temperature is held constant during the passage of the sample components through the separation column.

2.8 *Programmed Temperature Gas Chromatography* (PTGC), is the version of the technique in which the column temperature is changed with time during the passage of the sample components through the separation column. In linear PTGC the program rate is constant during analysis. Isothermal intervals may be included in the temperature program.

2.9 *Programmed Flow, Pressure, or Velocity Gas Chromatography* is the version of the technique in which the carrier gas flow, pressure, or velocity is changed during analysis.

2.10 *Reaction Gas Chromatography* is the version of the technique in which the composition of the sample is changed between sample introduction and the detector. The reaction can take place upstream of the column when the chemical composition of the individual components passing through the column differs from that of the original sample, or between the column and the detector when the original sample components are separated in the column but their chemical composition is changed prior to entering the detection device.

2.11 *Pyrolysis Gas Chromatography* is the version of reaction gas chromatography in which the original sample is decomposed by heat to more volatile components prior to passage through the separation column.

3. Apparatus

3.1 *Sample Inlet Systems*, represent the means for introducing samples into the separation column, including the heated zones permitting the vaporization of the introduced liquid samples prior to their passage through the column. Sample introduction can be carried out by introduction of a liquid, solid, or gas into the carrier-gas stream. The sample may be vaporized before or after introduction into the column.

¹ This practice is under the jurisdiction of ASTM Committee E13 on Molecular Spectroscopy and Separation Science and is the direct responsibility of Subcommittee E13.19 on Separation Science.

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