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Standard Practice for Packed Column Gas Chromatography[1]

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1. Scope

1.1 This practice is intended to serve as a general guide to the application of gas chromatography (GC) with packed columns for the separation and analysis of vaporizable or gaseous organic and inorganic mixtures and as a reference for the writing and reporting of GC methods.

NOTE 1—This practice excludes any form of gas chromatography associated with open tubular (capillary) columns.

1.2 *This standard does not purport to address all the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific hazard statements are given in Section 8 and 9.1.3.

2. Referenced Documents

2.1 *ASTM Standards:*

E 355 Practice for Gas Chromatography Terms and Relationships[2]

E 516 Practice for Testing Thermal Conductivity Detectors Used in Gas Chromatography[2]

E 594 Practice for Testing Flame Ionization Detectors Used in Gas Chromatography[2]

E 697 Practice for Use of Electron Capture Detectors in Gas Chromatography[2]

E 840 Practice for Using Flame Photometric Detectors in Gas Chromatography[2]

E 1140 Practice for Testing Nitrogen/Phosphorus Thermionic Ionization Detectors for Use in Gas Chromatography[2]

2.2 *CGA Publications:*

CGA P-1 Safe Handling of Compressed Gases in Containers[3]

CGA G-5.4 Standard for Hydrogen Piping Systems at Consumer Locations[3]

CGA P-9 The Inert Gases: Argon, Nitrogen and Helium[3]

CGA V-7 Standard Method of Determining Cylinder Valve Outlet Connections for Industrial Gas Mixtures[3]

CGA P-12 Safe Handling of Cryogenic Liquids[3]

HB-3 Handbook of Compressed Gases[3]

3. Terminology

3.1 Terms and relations are defined in Practice E 355 and references therein.

4. Summary of Practice

4.1 A block diagram of the basic apparatus needed for a gas chromatographic system is as shown in Fig. 1. An inert, pressure or flow-controlled carrier gas flowing at a measured rate passes to the injection port or gas sample valve. A sample is introduced into the injection port, where it is vaporized, or if gaseous, into a gas sample valve, and then swept into and through the column by the carrier gas. Passage through the column separates the sample into its components. The effluent from the column passes to a detector where the response of sample components is measured as they emerge from the column. The detector electrical output is relative to the concentration of each resolved component and is transmitted to a recorder, or electronic data processing system, or both, to produce a record of the separation, or chromatogram, from which detailed analysis can be obtained. The detector effluent must be vented to a hood if the effluent contains toxic substances.

4.2 Gas chromatography is essentially a physical separation technique. The separation is obtained when the sample mixture in the vapor phase passes through a column containing a stationary phase possessing special adsorptive properties. The degree of separation depends upon the differences in the distribution of volatile compounds, organic or inorganic, between a gaseous mobile phase and a selected stationary phase that is contained in a tube or GC column. In gas-liquid chromatography (GLC), the stationary phase is a nonvolatile liquid or gum coated as a thin film on a finely-divided, inert support of a relatively large surface area, and the distribution is based on partition. The liquid phase should not react with, and should have different partition coefficients for, the various components in the sample. In gas-solid chromatography (GSC), the stationary phase is a finely divided solid adsorbent (see 4.4).

4.2.1 After separation in the analytical column, the components are detected, and the detector signal is related to the concentration of the volatile components. Tentative identifications can be made by comparison with the retention times of

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

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[2] *Annual Book of ASTM Standards*, Vol 3.06.

[3] Available from Compressed Gas Association, Inc., 1725 Jefferson Davis Highway, Arlington, VA 22202-4100.

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