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Designation: D2685 – 95 (Reapproved 2003)

Standard Test Method for Air and Carbon Tetrafluoride in Sulfur Hexafluoride by Gas Chromatography[1]

This standard is issued under the fixed designation D2685; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the determination of air (Note 1) and carbon tetrafluoride as impurities in sulfur hexafluoride.

NOTE 1—Nitrogen, oxygen, or any of their mixtures is considered to be air. Commercial grade air or nitrogen is used for standardization.

1.2 *This standard does not purport to address all of 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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D2472 Specification for Sulfur Hexafluoride

3. Summary of Test Method

3.1 Air and carbon tetrafluoride are separated physically by gas chromatography and compared to corresponding components separated under similar conditions from a reference standard mixture of known composition. The individual compounds of air are not separated. The composition of the sample is calculated from its chromatogram by comparing the area of the peak of each component with the area of the peak of the corresponding component on the reference standard chromatogram.

4. Significance and Use

4.1 Air and carbon tetrafluoride (CF_4) are two contaminants of interest in sulfur hexafluoride (SF_6). Both of these contaminants adversely affect the performance of SF_6 when used as an electrical insulating gas. Specification for maximum levels of these contaminants are given in Specification D2472.

4.2 Gas chromatography is used to separate these contaminants from a sample of SF_6 and to determine their concentration.

5. Apparatus

5.1 *Gas Chromatograph*, consisting of a sample inlet system, adsorption column, flow meter, detector, and data handling system. Ensure that the column material of construction and sample components are compatible. The apparatus must completely separate air, carbon tetrafluoride, and sulfur hexafluoride as indicated by return of the recorded peak to the base line between each successive peak. Chromatograms must be reproducible so that successive runs of a reference standard agree on each component peak area or height within 5 %.

6. Reagents and Materials

6.1 *Cylinder of Helium Gas.*

6.2 *Reference Standard Mixture*—A gas mixture that contains known percentages of air and carbon tetrafluoride in helium or air and carbon tetrafluoride in sulfur hexafluoride is required. The concentration of a component in the reference sample should not be less than 50 % nor more than 300 % of the concentration of the corresponding component in the unknown.

7. Calibration and Standardization

7.1 *Apparatus Preparation*—Prepare the gas chromatograph for use as directed by the manufacturer. The following operating conditions have been found satisfactory. However, any combination of conditions that result in complete separations as indicated in the apparatus section will be satisfactory.

Carrier gas	helium, 40 to 50 mL/min
Column	Porapak Q-80/100 mesh or Porapak R 50/80 mesh
Column size	6 to 10 Ft (2–3.5 m) by ¼ in. (6.4 mm) nominal
Column temperature	40 to 50°C
Detector temperature	70 to 80°C
Sample volume	2 to 5 mL approximately
Attenuation	lowest which will keep peaks on a scale may be varied during run
Detector	thermal conductivity

7.2 *Example of Chromatography Conditions*—Specific conditions used by one laboratory which produces acceptable chromatograms are as follows:

Carrier gas	helium, 50 mL/min

[1] This test method is under the jurisdiction of ASTM Committee D27 on Electrical Insulating Liquids and Gases and is the direct responsibility of Subcommittee D27.03 on Analytical Tests.

Current edition approved Oct. 1, 2003. Published November 2003. Originally published as D2685 – 68. Last previous edition D2685 – 94. DOI: 10.1520/D2685-95R03.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

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