

SEMI C3.26-0301 (Withdrawn 0312) SPECIFICATION FOR TUNGSTEN HEXAFLUORIDE (WF₆) IN CYLINDERS, 99.8% QUALITY

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NOTICE: This Document was balloted and approved for withdrawal in 2011. It was replaced by SEMI C70.

1 Description

1.1 Tungsten hexafluoride is a colorless gas or colorless liquid. It is shipped as a liquefied gas under its own vapor pressure.

2 Specifications

2.1 QUALITY: 99.8%

<i>Impurities</i>	<i>Maximum Acceptable Level (ppm)^{#1}</i>
Carbon Tetrafluoride (CF ₄)	10
Hydrogen Fluoride (HF)	1000
Nitrogen (N ₂)	50
Oxygen (O ₂) + Argon (Ar)	50
Sulfur Hexafluoride	10
Silicon Tetrafluoride	10
TOTAL LISTED IMPURITIES	1130

^{#1} An analysis of significant figures has not been considered. The number of significant figures will be based on analytical accuracy and the precision of the provided procedure.

3 Physical Constants (for information only)

	<i>Metric Units</i>	<i>US Units</i>
Molecular weight	297.85	297.85
Boiling point at 1 atm	17.1°C	62.8°F
Density of gas at 22.8°C (73°F) and 1 atm	12.9 kg/m ³	0.805 lb/ft ³
Specific gravity of gas	10.8	10.8
Density of liquid at boiling point	3440 kg/m ³	214.8 lb/ft ³

4 Analytical Procedures (See Notes 1, 2, 3, 4, 5, 6, 7)

4.1 *Nitrogen and Oxygen + Argon* — This procedure is for the determination of nitrogen and oxygen + argon in tungsten hexafluoride using a gas chromatograph with a thermal conductivity detector.

4.1.1 *Detection Limits* — 10 ppm (mol/mol) nitrogen, and 10 ppm (mol/mol) oxygen + argon.

4.1.2 Instrument Parameters

4.1.2.1 Columns (See Figures 1 and 2)

- Column 1: Porapak S, 80/100 mesh, 1.5 m (5 ft.) by 6.4 mm (1/4 in.) OD, 5.1 mm (0.2 in.) ID, ss or equivalent.
- Column 2: Molecular sieve 5A, 80/100 mesh, 1.8 m (6 ft.) by 4.8 mm (3/16 in.) OD, 3.7 mm (0.147 in.) ID, ss or equivalent.

4.1.2.2 Column Flow: 30 mL/min helium.

4.1.2.3 Sample Volume: 2 mL.

4.1.2.4 Temperatures

- Detector — 70°C
- Column — 40°C

4.1.3 Calibration Standard — 50 ppm (mol/mol) nitrogen, 50 ppm (mol/mol) oxygen, balance helium.

4.1.4 Operating Procedures

4.1.4.1 Determine the times for valve switching and signal changes, and enter into the run table. An example of a run table follows.

Time	Position	Function
0 min.	1	Purge sample through loop. Backflush Porapak column. Connect MS column to the TCD.
1 min.	2	Inject sample onto Porapak column. Allow oxygen + argon and nitrogen to elute from the Porapak column to the MS column. Sequentially elute the oxygen + argon and nitrogen from the MS column to the TCD.
4 min.	1	Backflush Porapak column to vent for 8 minutes.

4.1.4.2 Set the valves in Position 1 (Figure 1).

4.1.4.3 Flow the calibration standard through the 10-port valve. Analyze standard using the conditions described above. Record retention times and peak areas.

4.1.4.4 Flow the sample to be tested through the 10-port valve for 1 minute. Analyze in the same manner as in ¶ 4.1.4.3.

4.1.4.5 The standard is again run as in ¶ 4.1.4.3.

4.1.4.6 Calculate the concentrations of nitrogen and oxygen + argon in the sample, using the formula below. The result may not exceed the specifications in § 2 of this Standard.

$$\frac{\text{Sample Peak Area}}{\text{Standard Peak Area}} \times \frac{\text{Concentration of Standard}}{\text{Concentration of Sample}} = \text{Concentration of Sample} \quad (1)$$

4.2 Carbon Tetrafluoride, Hydrogen Fluoride, Silicon Tetrafluoride, and Sulfur Hexafluoride — This procedure is for the determination of these gases in tungsten hexafluoride using infrared spectrophotometry. (See Note 2.)

4.2.1 Detection Limits — 10 ppm (mol/mol) carbon tetrafluoride, 1000 ppm (mol/mol) hydrogen fluoride, 10 ppm (mol/mol) silicon tetrafluoride and 10 ppm (mol/mol) sulfur hexafluoride.

4.2.2 Instrument Parameters

4.2.2.1 Cell path length: 10 cm

4.2.2.2 Sample Cell Pressure: 1 atmosphere.