

SEMI C3.37-0614

SPECIFICATION FOR HEXAFLUOROETHANE (C₂F₆), 99.97% QUALITY

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1 Purpose

1.1 The purpose of this Document is to provide specification for hexafluoroethane (C₂F₆) that is used in the semiconductor industry.

2 Scope

2.1 This Document covers requirements for hexafluoroethane used in the semiconductor industry.

NOTICE: SEMI Standards and Safety Guidelines do not purport to address all safety issues associated with their use. It is the responsibility of the users of the Documents to establish appropriate safety and health practices, and determine the applicability of regulatory or other limitations prior to use.

3 Referenced Standards and Documents

3.1 None.

4 Description

4.1 Hexafluoroethane is one of the most stable of all organic compounds. It is inert, colorless, nonflammable, odorless and tasteless.

5 Specifications

5.1 Quality: 99.97%

Table 1 Impurity Requirement for Hexafluoroethane

<i>Purity</i>	<i>99.97%</i>
<i>Impurities</i>	<i>Maximum Impurities Acceptable (ppm)^{#1}</i>
Carbon Dioxide (CO ₂)	1
Carbon Monoxide (CO)	1
Nitrogen (N ₂)	100
Other Halogenated Hydrocarbons (CF ₃ Cl, CF ₃ H, CF ₂ HCl, C ₂ F ₅ Cl)	50
Oxygen (O ₂)	25
Water (H ₂ O) (v/v)	40
TOTAL LISTED IMPURITIES	217

^{#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 method.

6 Chemical Specification

6.1 *Total Acidity* — 0.1 ppmw max.

7 Properties of Hexafluoroethane (for information only)

Table 2 Properties of Hexafluoroethane

	<i>Metric Units</i>	<i>US Units</i>
Molecular Formula	C ₂ F ₆	C ₂ F ₆
CAS Number	76-16-4	76-16-4
Molecular weight	138.01	138.01
Boiling point at 1 atm	-78.2°C	-108.8°F
Density of gas at 24°C (75°F) and 1 atm	5.734 kg/m ³	0.357 lb/ft ³
Specific gravity of gas at 24°C (75°F) and 1 atm	4.823	4.823
Density of liquid at -80.0°C (-112°F)	1611 kg/m ³	100.6 lb/ft ³

8 Test Method for Determining Impurity Limits (See Notes 1, 2, 3, 4 and Figure 1)

8.1 *Oxygen, Nitrogen, Carbon Monoxide, and Carbon Dioxide* — This method is for the determination of oxygen, nitrogen, carbon monoxide, and carbon dioxide in hexafluoroethane using a gas chromatograph with an ultrasonic detector.

8.1.1 *Detection Limit* — 0.5 ppm (mol/mol) for each impurity.

8.1.2 *Instrument Parameters*

8.1.2.1 *Columns*

- *Column 1* — Haysep® D, 100/120 mesh, 4.6 m (15 ft.) by 3.2 mm (1/8 in.) OD ss, or equivalent.
- *Column 2* — Porapak™ QS, 100/120 mesh, 2.1 m (7 ft.) by 3.2 mm (1/8 in.) OD ss, or equivalent.
- *Column 3* — Porapak™ QS, 100/120 mesh, 3.6 m (2 ft.) by 3.2 mm (1/8 in.) OD ss, or equivalent.
- *Column 4* — Haysep® D, 100/120 mesh, 4.6 m (15 ft.) by 3.2 mm (1/8 in.) OD ss, or equivalent.
- *Column 5* — Molecular Sieve 13X, 45/60 mesh, 2.1 m (7 ft.) by 3.2 mm (1/8 in.) OD ss, or equivalent.

8.1.2.2 *Carrier Flow* — 16 mL/min helium.

8.1.2.3 *Sample Volume* — 1.0 and 2.0 mL.

8.1.2.4 *Temperatures*

- *Detector* — 120°C.
- *Column 1, 2, and 5* — 50°C.
- *Column 3 and 4* — 90°C.
- *Valve* — 90°C.

8.1.2.5 *Time Table* — Determine the times for valve switching and signal changes, and enter into the run table.

Table 3 Run Table Example

<i>Valve</i>	<i>On</i>	<i>Off</i>
1	0.01	#1
2	9.20	#1
3	0.01	12.00

#1 Valve left on until end of run.