

SEMI C3.47-1011 (Reapproved 0218) SPECIFICATION FOR HYDROGEN BROMIDE (HBr), 99.98% QUALITY

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1 Purpose

1.1 The purpose of this Document is to provide specifications for hydrogen bromide (HBr) that is used in the semiconductor industry.

2 Scope

2.1 This Document covers requirements for hydrogen bromide (HBr) 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 Hydrogen bromide is an irritating and corrosive gas with a sharp, penetrating, suffocating odor. It is colorless and nonflammable, but fumes in moist air.

5 Specifications

Table 1 Impurity Limits and Other Requirements for Hydrogen Bromide

Grade	99.98%
Assay(Total Acidity)	98% min
Impurities	Maximum Impurities Acceptable (ppm) ^{#1}
Carbon Dioxide (CO ₂)	50
Carbon Monoxide (CO)	5
Hydrogen Chloride (HCl)	^{#2}
Methane (CH ₄)	15
Oxygen (O ₂) + Nitrogen (N ₂)	50
Water (H ₂ O) (v/v)	5
TOTAL LISTED IMPURITIES (excluding metals)	125
Iron (Fe)	1 (by weight, vapor phase)

^{#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.

^{#2} To be analyzed and reported (typically 500 ppm).

6 Properties of Hydrogen Bromide (for information only)

Table 2 Properties of Hydrogen Bromide

	<i>Metric Units</i>	<i>U.S. Units</i>
Molecular Weight	80.92	80.92
CAS Number	10035-10-6	10035-10-6
Boiling Point at 101 kPa (1 atm)	-66.7°C	-88.1°F
Density of gas at 70°F (21.1°C) and 101 kPa (1 atm)	3.333 g/L	0.208 lb/ft ³
Specific gravity of gas	2.7	2.7
Critical Pressure	85.16 bar	1234.8 psia
Critical Temperature	90°C	193.6°F

7 Analytical Procedures

7.1 Nitrogen, Oxygen, Carbon Monoxide, Methane, and Carbon Dioxide — This procedure is for the determination of nitrogen, oxygen + argon, carbon monoxide, methane, and carbon dioxide using a gas chromatograph with a discharge ionization detector.

7.1.1 Detection Limits

- N₂ < 10 ppb
- O₂ + Ar < 20 ppb
- CO < 20 ppb
- CH₄ < 10 ppb
- CO₂ < 10 ppb

7.1.2 Instrument Parameters — All components are analyzed using two columns and two detectors with a single injection. (See Figure 1.)

7.1.2.1 Columns:

- HayeSep® Db 2.0 m (6 ft.) by 3.2 mm (1/8 in.) O.D. by 2.2 mm (0.085 in.) I.D.
- Molecular sieve 5A 2.0 m (6 ft.) by 3.2 mm (1/8 in.) O.D by 2.2 mm (0.085 in.) I.D. ss or equivalent (60/80 mesh)

7.1.2.2 Carrier Flow — 40 mL/min He.

7.1.2.3 Sample Volume — 1.0 mL.

7.1.2.4 Temperatures

- Detector: 100°C.
- Column 1: 40°C.
- Column 2: 100°C.

7.1.3 Calibration Standards — 5 ppm of each compound of interest including nitrogen, oxygen, carbon monoxide, methane, and carbon dioxide in helium.

7.1.4 Operating Procedures

7.1.4.1 Inject a sample of the calibration standard into the HayeSep column using a gas sample valve. Allow the effluent of HayeSep column to enter the Molecular Sieve column until after CO has eluted. Switch the switching valve to allow the methane and CO₂ to elute directly into detector A while oxygen, nitrogen, and CO separate on the molecular sieve column and elute into detector B. Record retention times and peak areas for all peaks. The order of