

SEMI C3.46-1102

SPECIFICATION FOR ARGON (Ar), BULK LIQUID, 99.9992% QUALITY

This Standard was technically approved by the Gases Global Technical Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee on July 21, 2002. Available at www.semi.org in November 2002; originally published in 1993.

NOTICE: This Document is no longer supported by the global technical committee. It has been replaced by SEMI C57.

1 Purpose

1.1 The purpose of this Document is to provide a specification for Argon (Ar) used in the semiconductor industry.

2 Scope

2.1 This Document covers requirements for Argon (Ar) used in the semiconductor industry.

2.2 If analytical methods are not complete, the requirements are presented as a guideline.

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 Description

3.1 Argon is the most abundant member of the rare gas family. It is monatomic and is characterized by its extreme chemical inactivity. Argon is a colorless, odorless and tasteless gas somewhat soluble in water. It is normally delivered and stored as a cryogenic liquid.

4 Referenced Standards and Documents

4.1 *SEMI Standards and Safety Guidelines*

SEMI C1 — Guide for the Analysis of Liquid Chemicals

SEMI C3 — Specification for Gases

NOTICE: Unless otherwise indicated, all documents cited shall be the latest published versions.

5 Terminology

5.1 Terminology appropriate to this Standard is defined in SEMI C3.

6 Specifications

6.1 QUALITY: 99.9992%

<i>Impurities</i>	<i>Maximum Acceptable Level (ppm)^{#1}</i>
Carbon monoxide and carbon dioxide (CO + CO ₂)	0.5
Hydrogen (H ₂)	1
Nitrogen (N ₂)	5
Oxygen (O ₂)	0.5
Particles	#2
Total Hydrocarbons expressed as Methane (THC)	0.5
Water (H ₂ O) (v/v)	0.5

<i>Impurities</i>	<i>Maximum Acceptable Level (ppm)^{#1}</i>
TOTAL SPECIFIED IMPURITIES	8

#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 determined between supplier and user.

7 Physical Constants (for information only)

	<i>Metric Units</i>	<i>US Units</i>
Molecular weight	39.948	39.948
Boiling point at 1 atm	-185.9°C	-302.6°F
Density of gas at 21.1°C (70°F) and 1 atm	1.656 kg/m ³	0.1034 lb/ft ³
Specific gravity of gas at 21.1°C and 1 atm (air = 1)	1.38	1.38
Density of liquid at boiling point	139 kg/m ³	8.698 lb/ft ³

8 Analytical Procedures

NOTE 1: Introduce the calibration standard as many times as necessary to achieve the desired precision.

NOTE 2: All gases used in the analysis of the sample should contain not more than 10% of the specified value of the component of interest unless otherwise specified.

8.1 *Carbon Monoxide and Carbon Dioxide* — This procedure is for the determination of carbon monoxide and carbon dioxide in argon using a gas chromatograph with a flame ionization detector and methanizer.

8.1.1 *Detection Limit* — 100 ppb.

8.1.2 *Instrument Parameters*

8.1.2.1 *Column:*

- Porapak T or Q, 3 m (9.8 ft.) by 3.2 mm (1/8 in.) OD by 2.2 mm (0.085 in.) ID ss; or
- Chromosorb 102, 2 m (6.6 ft.) by 3.2 mm (1/8 in.) OD by 2.2 mm (0.085 in.) ID ss; or equivalent.

8.1.2.2 *Carrier Flow:* 30 mL/min helium.

8.1.2.3 *Sample Volume:* 0.5 to 2.0 mL.

8.1.2.4 *Temperatures*

- Detector: 280°C.
- Column Oven: 60°C.
- Methanizer: 350°C.

8.1.3 *Calibration Standard* — 0.2 to 1 ppm carbon monoxide, 0.2 to 1 ppm carbon dioxide, balance argon.

8.1.4 *Operating Procedure*

8.1.4.1 Inject the calibration standard into the column using a gas sampling valve. Record the retention times and peak areas. The order of elution is carbon monoxide, carbon dioxide.

8.1.4.2 Inject the sample to be tested in same manner as the calibration standard. Record the retention times and peak areas.