

SEMI C65-0308

GUIDELINE FOR TRIMETHYLSILANE (3MS), 99.995% QUALITY

This Standard was technically approved by the Liquid Chemicals Global Technical Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee on December 20, 2007. Available at www.semi.org in February 2008.

1 Purpose

1.1 The purpose of this Document is to provide specifications for trimethylsilane (3MS) used in the semiconductor industry.

2 Scope

2.1 This Document covers requirements for trimethylsilane (3MS) 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 Description

3.1 Trimethylsilane is a liquefied compressed flammable colorless, non-corrosive gas. Trimethylsilane or 3MS $[(CH_3)_3SiH]$ is used in the semiconductor industry for plasma enhanced chemical vapor deposition (PECVD) as low k dielectric and as a SIC etch stop, hard mask and copper diffusion barrier precursor.

4 Referenced Standards and Documents

4.1 None.

5 Specifications

5.1 Purity of 99.995% grade for trimethylsilane (3MS) is given in Table 1.

Table 1 Impurity for Trimethylsilane (3MS)

<i>Impurities</i>	<i>Maximum Acceptable Level</i>
Carbon Monoxide (CO)	2 ppmv
Carbon Dioxide (CO ₂)	2 ppmv
Total Hydrocarbon (THC)	5 ppmv
Nitrogen (N ₂)	2 ppmv
Oxygen (O ₂) + Argon (Ar)	2 ppmv
Metals, each element See Table 2 below.	5 ppbv
Water (H ₂ O)	1 ppmv

#1 Ppmv: part per million (vol/vol).

Table 2 List of Metals

Al	Sb	As	Ca	Cr
Co	Cu	Ge	Fe	Pb
Li	Mg	Mn	Ni	K
Na	Sn	Ti	W	Zn

NOTE 1: Standardized test methods are being developed for all parameters at the purity level indicated. Until standardized test methods are published, test methodology shall be determined by user and producer.

6 Physical Constants

6.1 CAS# 993-07-7

6.2 The physical constants for trimethylsilane 3MS are given in Table 3.

Table 3 Physical Constants of Trimethylsilane 3MS (for information only)

	<i>Metric Units</i>	<i>US Units</i>
Molecular Weight (g/mol)	74.2	74.2
Boiling point at 1 atm	6.7°C	44.1°F
Density of gas at 25°C (77°F) and 1 atm	3.1 g/L	0.193 lb/ft ³
Density of liquid at 6.7°C (44.1°F) and 1 atm	0.64 g/mL	39.95 lb/ft ³
Vapor Pressure at 20°C	1.64 Bar	23.79 psi

7 Analytical Procedures

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

NOTE 2: An optional temperature ramping during vent will shorten the analysis time.

NOTE 3: Carrier gases should contain less than 0.1 ppm carbon monoxide and less than 0.1 ppm carbon dioxide.

7.1.1 *Detection Limit* — 0.1 ppm for each impurity.

7.1.2 *Instrument Parameters*

7.1.2.1 *Column:*

- *Column 1* — Porapak QS 2.5 m (8.2 ft.) by 2.1 mm ID.
- *Column 2* — Porapak T 2 m (6.6 ft.) by 2.1 mm ID.

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

7.1.2.3 *Sample Volume:* 0.5 mL.

7.1.2.4 *Support Gases:* As specified by the instrument manufacturer.

7.1.2.4.1 *Hydrogen N50:* 20 to 30 mL per min added to the carrier gas between the column outlet and the methanizer inlet.

7.1.2.4.2 *Air:* 500 mL/min.

7.1.2.5 *Temperatures:*

- *Detector* — 350°C.
- *Oven* — 45°C.

7.1.3 *Calibration Standards* — ~5ppm carbon monoxide, ~5ppm carbon dioxide, balance helium.

7.1.4 *Operating Procedure*

7.1.4.1 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. Repeat this operation.

7.1.4.2 Inject the sample to be tested in same manner as the calibration standard and vent after elution of carbon dioxide is completed. Record the retention times and peak areas.