# SEMI C75-0811 (Reapproved 0317)
# GUIDE FOR TETRAKIS(DIMETHYLAMINO)TITANIUM

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 8, 2016. Available at www.semiviews.org and www.semi.org in March 2017; originally published August 2011.

## 1 Purpose

1.1 The purpose of this Document is to provide a guide for tetrakis(dimethylamino)titanium for which a need has been identified.

## 2 Scope

2.1 The scope of this Document covers high purity tetrakis(dimethylamino)titanium which is used in the semiconductor industry primarily, but not exclusively, for the deposition of titanium nitride layers by atomic layer deposition or chemical vapor deposition.

**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 Limitations

3.1 None.

## 4 Referenced Standards and Documents

4.1 *SEMI Standards and Safety Guidelines*

SEMI C1 — Guide for the Analysis of Liquid Chemicals

4.2 *ASTM Standard*[1]

ASTM D5127 — Standard Guide for Ultra-Pure Water Used in the Electronics and Semiconductor Industries

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

## 5 Terminology

5.1 *Abbreviations and Acronyms*

5.1.1 *TDMAT* — tetrakis(dimethylamino)titanium

5.1.2 *NMR* — nuclear magnetic resonance

5.1.3 *TMS* — tetramethylsilane

[1] ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA; Telephone: +1.610.832.9585, Fax: +1.610.832.9555, http://www.astm.org



Documents Document Sharing Hub

Full document details: SEMI C75-0811-0317R

## 6 Properties

**Table 1 Properties of Tetrakis(Dimethylamino)Titanium and CAS Number (for information only)**

| | |
|---|---|
| Molecular Formula | $Ti[N(CH_3)_2]_4$ |
| Molecular Weight | 224.17 g/mol |
| CAS Number | 3275-24-9 |
| Boiling Point | 50°C at 0.5 mmHg |
| Vapor Pressure (P = mmHg, T = K) | $\log_{10}P = 8.600 - 2850 / T$ |
| Melting Point | −30°C |
| Solubility in Water | Reacts |
| Appearance | Yellow liquid |

## 7 Suggested Values

7.1 The suggested values for tetrakis(dimethylamino)titanium for Tier A are listed in Table 2.

## 8 Grade 1 Procedures

8.1 This section does not apply to this chemical.

## 9 Grade 2 Procedures

9.1 This section does not apply to this chemical.

## 10 Grade 3 Procedures

10.1 This section does not apply to this chemical.

## 11 Grade 4 Procedures

11.1 This section does not apply to this chemical.

## 12 Tier A Procedures

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.

12.1 *Trace Metals Analysis* — The following method has given satisfactory results in determining trace metal impurities at the specified value for the elements listed in Table 2.

12.1.1 *Mixed Acid* — Prepared by dilution of ultrapure 49% HF, ultrapure 70% $HNO_3$ and ultrapure 31% $H_2O_2$ with ultrapure water in the following ratio: 25 mL of HF, 10 mL of $HNO_3$ and 10 mL of $H_2O_2$ to 500 mL with water.

12.1.2 *Standards* — Prepare multielement standard solutions (calibration standards and quality control check standards) by diluting with mixed acid described in ¶ 12.1.1 of appropriate weights for inductively couple plasma mass spectrometry (ICP-MS).

12.1.3 *Sample Preparation* — Dispense approximately 0.1 mL of the tetrakis(dimethylamino)titanium sample into a dry and clean PFA sample bottle and record the weight to at least 3 decimal places. Under hood, add 49% HF dropwise into the sample aliquot. The sample will react vigorously with the HF; allow the reaction to proceed until it subsides before adding the next drop. Repeat until 2 mL of HF have been added. Dilute the sample with the acid mixture containing $H_2O_2$, $HNO_3$ and HF (¶ 12.1.1). The final dilution factor of the sample should be appropriate to minimize the space charge effects in the ICP-MS measurement of the sample. This dilution factor will be dependent on the type of ICP-MS used.



Documents
Document Sharing Hub
Full document details: SEMI C75-0811-0317R