

SEMI C68-0811 (Reapproved 0317) GUIDE FOR ZIRCONIUM AMIDES

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 zirconium amides for which a need has been identified.

2 Scope

2.1 The scope of this Document covers high purity zirconium amides, namely, tetrakis(dimethylamino) zirconium, tetrakis(diethylamino) zirconium and tetrakis(ethylmethylamino) zirconium which are used in the semiconductor industry for the deposition of zirconium oxide based layers by atomic layer 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 Standard¹

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 *NMR* — nuclear magnetic resonance
- 5.1.2 *TDEAZ* — tetrakis(diethylamino) zirconium
- 5.1.3 *TDMAZ* — tetrakis(dimethylamino) zirconium
- 5.1.4 *TEMAZ* — tetrakis(ethylmethylamino) zirconium
- 5.1.5 *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>

6 Properties

Table 1 Properties for TDMAZ (for information only)

Molecular Formula	$\text{Zr}[\text{N}(\text{CH}_3)_2]_4$
Molecular Weight	267.53 g/mol
CAS Number	19756-04-8
Boiling Point	80°C at 0.1 mmHg
Vapor Pressure	1 Torr at 77°C
Melting Point	57°C to 60°C
Solubility in Water	Reacts
Appearance	Solid

Table 2 Properties for TDEAZ (for information only)

Molecular Formula	$\text{Zr}[\text{N}(\text{CH}_2\text{CH}_3)_2]_4$
Molecular Weight	379.73 g/mol
CAS Number	13801-49-5
Boiling Point	112°C at 0.01 mmHg
Solubility in Water	Reacts
Appearance	Yellow liquid

Table 3 Properties for TEMAZ (for information only)

Molecular Formula	$\text{Zr}[\text{N}(\text{CH}_2\text{CH}_3)(\text{CH}_3)]_4$
Molecular Weight	323.63 g/mol
CAS Number	175923-04-3
Boiling Point	81°C at 0.1 mmHg
Vapor Pressure (P = mmHg, T = K)	$\log_{10} P = 7.3218 - 2759.9/T$
Liquid Density at 25°C	1.049 g/cm ³
Solubility in Water	Reacts
Appearance	Liquid

7 Suggested Values

7.1 The suggested values for zirconium amides for Tier A are listed in Table 4.

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.