

SEMI F51-0200

GUIDE FOR ELASTOMETRIC SEALING TECHNOLOGY

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1 Purpose

1.1 The purpose of this Document is to introduce a basic guide for the use of seals in semiconductor fabrication equipment. Also, to introduce the diverse chemical and physical requirements for the many process applications, and to reduce cost of ownership and improve up-time through the use of appropriate sealing materials. It is important that equipment users, suppliers, OEMs, and seal manufacturers use the same terminology and that communication can take place at the same level so that actual performance of the equipment can be discussed.

2 Scope

2.1 This Guide is applicable to the use of seals in specific operating environments used in the fabrication of semiconductor devices. This Guide will aid in defining the seal parameters for the various process environments. It includes those elastomeric seals that come in contact with process liquids and or gases.

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 The application of this Guide is limited to elastomeric sealing technology performance as used in semiconductor manufacturing and related process equipment.

4 Referenced Standards and Documents

4.1 SEMI Standards and Safety Guidelines

SEMI C3 — Specifications for Gases

SEMI D9 — Definitions for Flat Panel Display Substrates

SEMI E45 — Test Method for the Determination of Inorganic Contamination from Minienvironments

SEMI F21 — Classification of Airborne Molecular Contaminant Levels in Clean Environments

SEMI P5 — Specification for Pellicles

SEMI S4 — Safety Guideline for the Segregation/Separation of Gas Cylinders Contained in Cabinets

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

5 Terminology

5.1 Abbreviations and Acronyms

5.1.1 ATM — atmospheric

5.1.2 BCD — bulk chemical dispensing system

5.1.3 CVD — chemical vapor deposition

5.1.4 DI — de-ionized

5.1.5 HDP — high density plasma

5.1.6 HF — hydrofluoric acid

5.1.7 LPCVD — low pressure chemical vapor deposition

5.1.8 *MOCVD* — metal organic chemical vapor deposition

5.1.9 *OEM* — original equipment manufacturer

5.1.10 *PPB* — parts per billion

5.1.11 *PVD* — physical vapor deposition

5.1.12 *RF* — radio frequency

5.1.13 *RTP* — rapid thermal process

5.1.14 *T.O.C. (total organic carbons)* — hydrocarbons which can appear in a process from a variety of sources including breakdown of O-ring materials.

5.1.15 *UPDI* — ultra pure de-ionized

5.1.16 *UV* — ultraviolet

5.2 Definitions

5.2.1 *acid* — a corrosive material whose chemical reaction characteristic is that of an electron acceptor. [SEMI F21, SEMI S4]

5.2.2 *anion* — a negatively charged ion that is attracted to an anode in electrolysis.

5.2.3 *cation* — a positively charged ion; an ion that is attracted to the cathode in electrolysis. These are typically ions of metallic elements.

5.2.4 *chemical/mechanical wear* — injury to the surface of an object or partial obliteration of or altering caused by rubbing, stress or chemical/mechanical use.

5.2.5 *chemical breakdown* — the degradation of a seal as the result of a chemical reaction.

5.2.6 *chemical property* — chemical durability is a measure of corrosion or attack of a glass surface when subjected to a specific reagent, such as acid, base, or water at a specific concentration for a specific time and temperature. [SEMI D9]

5.2.7 *chemical reaction* — a process that involves change in the structure of ions or molecules.

5.2.8 *compatibility* — the ability of the molecules of a seal to coexist with process chemistries without the degradation of either.

5.2.9 *corrosives* — a chemical that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the site of contact. A chemical is considered to be corrosive if, when tested on the intact skin of albino rabbits by the method described in the U.S. Department of Transportation in Appendix A to 49 CFR 173, it destroys or changes irreversibly the structure of the tissue at the site of contact following an exposure period of four hours. This term shall not refer to action on inanimate surfaces. [SEMI S4]

5.2.10 *de-ionized water* — (specified with specific resistivity $\geq 18 \text{ M}\Omega\text{cm}$, cations: Na, Fe, Ca $\leq 0.2 \text{ }\mu\text{g/l}$). [SEMI E45]

5.2.11 *degradation* — a chemical reaction leading to the reduction to a simpler molecular structure. See also chemical breakdown.

5.2.12 *ion* — an atom or group of atoms that has lost or gained one or more electrons.

5.2.13 *leachables* — atoms or molecules which escape from the body of a material under vacuum, heat or chemical attack.

5.2.14 *leak rate* — rate at which an environment loses a vacuum (Millitorr litres/second).

5.2.15 *outgassing* — process whereby molecules of air or other gases adhere to the surface of the vacuum vessel or component therein and become liberated under vacuum conditions. Sometimes known as degassing.

5.2.16 *oxidizer gas* — a gas which will support combustion or increase the burning rate of a combustible material with which it may come in contact. [SEMI S4]