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Standard Test Method for Determination of Oxygen Contribution by Gas Distribution System Components[1]

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INTRODUCTION

Semiconductor clean rooms are serviced by high-purity gas distribution systems. This test method presents a procedure that may be applied for the evaluation of one or more components considered for use in such systems.

1. Scope

1.1 This test method covers a procedure for testing components for oxygen contribution to ultra-high purity gas distribution systems at ambient temperature. In addition, this test method allows testing of the component at elevated ambient temperatures as high as 70°C.

1.2 This test method applies to in-line components containing electronics grade materials such as those used in a semiconductor gas distribution system.

1.3 *Limitations*:

1.3.1 This test method is limited by the sensitivity of current instrumentation, as well as the response time of the instrumentation. This test method is not intended to be used for test components larger than 12.7-mm (½-in.) outside diameter nominal size. This test method could be applied to larger components; however, the stated volumetric flow rate may not provide adequate mixing to ensure a representative sample. Higher flow rates may improve the mixing but excessively dilute the sample.

1.3.2 This test method is written with the assumption that the operator understands the use of the apparatus at a level equivalent to six months of experience.

1.4 The values stated in SI units are to be regarded as the standard. The inch-pound units given in parentheses are for information only.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific hazard statements are given in Section 6.

2. Terminology

2.1 *Definitions:*

2.1.1 *baseline*—the instrument response under steady state conditions.

2.1.2 *glove bag*—an enclosure that contains a controlled atmosphere. A glove box could also be used for this test method.

2.1.3 *heat trace*— heating of a component, spool piece, or test stand by a uniform and complete wrapping of the item with resistant heat tape.

2.1.4 *minimum detection limit (MDL) of the instrument*—the lowest instrument response detectable and readable by the instrument, and at least two times the amplitude of the noise.

2.1.5 *response time*—the time required for the system to reach steady state after a change in concentration.

2.1.6 *spool piece*—a null component, consisting of a straight piece of electropolished tubing and appropriate fittings, used in place of the test component to establish the baseline.

2.1.7 *standard conditions*—101.3 kPa, 0.0°C (14.73 psia, 32°F).

2.1.8 *test component*—any device being tested, such as a valve, regulator, or filter.

2.1.9 *test stand*—the physical test system used to measure impurity levels.

2.1.10 *zero gas*—a purified gas that has an impurity concentration below the MDL of the analytical instrument. This gas is to be used for both instrument calibration and component testing.

2.2 *Symbols:*

2.2.1 P_1—The inlet pressure measured upstream of the purifier and filter in the test apparatus.

2.2.2 P_2—The outlet pressure measured downstream of the analyzer in the test apparatus.

2.2.3 *ppbv*—Parts per billion by volume assuming ideal gas behavior, equivalent to nmole/mole (such as nL/L). The same as molar parts per billion (ppb).

2.2.4 *ppbw*—Parts per billion by weight (such as ng/g).

[1] This test method is under the jurisdiction of ASTM Committee F-1 on Electronicsand is the direct responsibility of Subcommittee F01.10 on Processing Environments.

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