



Standard Guide for Metallurgical Analysis for Gas Distribution System Components¹

This standard is issued under the fixed designation F 1376; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

Semiconductor clean rooms are serviced by high-purity gas distribution systems. This guide 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 guide covers corrosion resistant metallic alloys of the general class stainless steel, containing chromium, nickel, manganese, and silicon as major alloying additions and possibly molybdenum, that are qualified or specified for the materials of components used in high-purity gas supply systems for the semiconductor industry. This guide is primarily intended for testing to determine conformance to applicable composition and metallurgical specifications as stated in supplier product specifications or customer purchase specifications, or both.

1.2 Elements analyzed and reported in this guide are as follows:

1.2.1 The alloying additions chromium, nickel, and molybdenum (if specified in alloy, as in type 316L),

1.2.2 The minor elements and residuals manganese, silicon, copper, cobalt, and stabilizers such as titanium and columbium (niobium), if present,

1.2.3 Carbon, sulfur and phosphorus,

1.2.4 Nitrogen and oxygen gases,

1.2.5 Any additional minor element additions that may be made as part of the melting and casting practice, such as aluminum and calcium,

1.2.6 Available standard analytical and reporting techniques are described for these elements.

1.3 Metallurgical characteristics to be analyzed and reported are inclusion contents, grain structure, mechanical properties, and intergranular corrosion susceptibility.

1.4 *Limitations:*

1.4.1 This guide is limited to corrosion resistant metal alloys of the general class stated in the Scope.

1.4.2 The test methods cited in this guide are not intended to preclude the use of other generally accepted techniques of demonstrated equivalent or superior precision and bias.

1.4.3 Inclusion of testing and analysis procedures for any given element or metallurgical characteristic in this guide is not to be construed as being a requirement for incorporation of that element or metallurgical characteristic into any specifications.

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

1.6 *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.*

2. Referenced Documents

2.1 *ASTM Standards:*²

A 262 Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products

A 479/A 479M Specification for Stainless and Heat-Resisting Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels

A 484/A 484M Specification for General Requirements for Stainless and Heat-Resisting Steel Bars, Billets, and Forgings²

A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products

¹ This guide is under the jurisdiction of ASTM Committee F01 on Electronics and is the direct responsibility of Subcommittee F01.10 on Processing Environments.

Current edition published Feb. 15, 1992. Approved April 1992.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.