



Standard Test Method for Trace Metallic Impurities in Electronic Grade Aluminum- Copper, Aluminum-Silicon, and Aluminum-Copper-Silicon Alloys by High-Mass-Resolution Glow Discharge Mass Spectrometer¹

This standard is issued under the fixed designation F 1845; 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.

1. Scope

1.1 This test method determines the concentrations of trace metallic impurities in high purity (99.99 wt. % pure, or purer, with respect to metallic trace impurities) aluminum-copper, aluminum-silicon and aluminum-copper-silicon alloys with major alloy constituents as follows:

aluminum	Greater than 95.0 %
copper	Less or equal than 5.0 %
silicon	Less or equal than 5.0 %

1.2 This test method pertains to analysis by magnetic-sector glow discharge mass spectrometer (GDMS).

1.3 This test method does not include all the information needed to complete GDMS analyses. Sophisticated computer-controlled laboratory equipment, skillfully used by an experienced operator, is required to achieve the required sensitivity. This test method does cover the particular factors (for example, specimen preparation, setting of relative sensitivity factors, determination of detection limits, etc.) known by the responsible technical committee to effect the reliability of high purity aluminum analyses.

1.4 *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:

E 135 Terminology Relating to Analytical Chemistry for Metals, Ores, and Related Materials²

E 180 Practice for Determining the Precision of ASTM Methods for Analysis and Testing of Industrial and Specialty Chemicals³

E 673 Terminology Relating to Surface Analysis²

E 876 Practice for Use of Statistics in the Evaluation of Spectrometric Data

F 1593 Test Method for Trace Metallic Impurities in Electronic Grade Aluminum by High-Mass-Resolution Glow Discharge Mass Spectrometer⁴

F 1594 Specification for Pure Aluminum (Unalloyed) Source Material for Vacuum Coating Applications⁵

3. Terminology

3.1 Terminology in this test method is consistent with Terminology E 135. Required terminology specific to this test method, not covered in Terminology E 135, is indicated in 3.2.

3.2 Definitions:

3.2.1 *campaign*—a test procedure to determine the accuracy of the instrument, which was normally performed at the beginning of the day or after the instrument modification, or both.

3.2.2 *reference sample*—material accepted as suitable for use as a calibration/sensitivity reference standard by all parties concerned with the analyses.

3.2.3 *specimen*—a suitably sized piece cut from a reference or test sample, prepared for installation in the GDMS ion source, and analyzed.

3.2.4 *test sample*—material (aluminum alloy) to be analyzed for trace metallic impurities by this GDMS method.

3.2.4.1 *Discussion*—Generally the test sample is extracted from a larger batch (lot, casting) of product and is intended to be representative of the batch.

4. Summary of Test Method

4.1 A specimen is mounted in a plasma discharge cell. Atoms subsequently sputtered from the specimen surface are ionized, and then focused as an ion beam through a double-focusing magnetic-sector mass separation apparatus. The mass spectrum (the ion current) is collected as magnetic field or acceleration voltage, (or both) is scanned.

¹ This test method is under the jurisdiction of ASTM Committee F01 on Electronics and is the direct responsibility of Subcommittee F01.17 on Sputter Metallization.

Current edition approved Dec. 10, 2002. Published May 2003. Originally approved in 1997. Last previous edition approved in 1997 as F 1845 – 97.

² *Annual Book of ASTM Standards*, Vol 03.05.

³ *Annual Book of ASTM Standards*, Vol 15.05.

⁴ *Annual Book of ASTM Standards*, Vol 10.04.