



Standard Test Method for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment¹

This standard is issued under the fixed designation E 595; 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.

This standard has been approved for use by agencies of the Department of Defense.

^{ε1} NOTE—Keywords were added editorially in October 2003.

1. Scope

1.1 This test method covers a screening technique to determine volatile content of materials when exposed to a vacuum environment. Two parameters are measured: total mass loss (TML) and collected volatile condensable materials (CVCVM). An additional parameter, the amount of water vapor regained (WVR), can also be obtained after completion of exposures and measurements required for TML and CVCVM.

1.2 This test method describes the test apparatus and related operating procedures for evaluating the mass loss of materials being subjected to 125°C at less than 7×10^{-3} Pa (5×10^{-5} torr) for 24 h. The overall mass loss can be classified into noncondensables and condensables. The latter are characterized herein as being capable of condensing on a collector at a temperature of 25°C.

NOTE 1—Unless otherwise noted, the tolerance on 25 and 125°C is $\pm 1^\circ\text{C}$ and on 23°C is $\pm 2^\circ\text{C}$. The tolerance on relative humidity is $\pm 5\%$.

1.3 Many types of organic, polymeric, and inorganic materials can be tested. These include polymer potting compounds, foams, elastomers, films, tapes, insulations, shrink tubings, adhesives, coatings, fabrics, tie cords, and lubricants. The materials may be tested in the “as-received” condition or prepared for test by various curing specifications.

1.4 This test method is primarily a screening technique for materials and is not necessarily valid for computing actual contamination on a system or component because of differences in configuration, temperatures, and material processing.

1.5 The criteria used for the acceptance and rejection of materials shall be determined by the user and based upon specific component and system requirements. Historically, TML of 1.00 % and CVCVM of 0.10 % have been used as screening levels for rejection of spacecraft materials.

1.6 The use of materials that are deemed acceptable in accordance with this test method does not ensure that the system or component will remain uncontaminated. Therefore, subsequent functional, developmental, and qualification tests should be used, as necessary, to ensure that the material’s performance is satisfactory.

1.7 *This standard does not purport to address all of the safety concerns 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

E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

2.2 ASTM Adjuncts:

Micro VCM Detailed Drawings³

3. Terminology

3.1 Definitions:

3.1.1 *collected volatile condensable material, CVCVM*—the quantity of outgassed matter from a test specimen that condenses on a collector maintained at a specific constant temperature for a specified time. CVCVM is expressed as a percentage of the initial specimen mass and is calculated from the condensate mass determined from the difference in mass of the collector plate before and after the test.

3.1.2 *total mass loss, TML*—total mass of material outgassed from a specimen that is maintained at a specified constant temperature and operating pressure for a specified time. TML is calculated from the mass of the specimen as

¹ This test method is under the jurisdiction of ASTM Committee E21 on Space Simulation and Applications of Space Technology and is the direct responsibility of Subcommittee E21.05 on Contamination.

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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.

³ Available from ASTM International, 100 Barr Harbor Dr., PO Box C700, West Conshohocken, PA 19428–2959. Order Adjunct ADJE0595.