Designation: E 1447 – 92 (Reapproved 1996)

Standard Test Method for Determination of Hydrogen in Titanium and Titanium Alloys by the Inert Gas Fusion Thermal Conductivity Method[1]

This standard is issued under the fixed designation E 1447; 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 applies to the determination of hydrogen in titanium and titanium alloys in concentrations from 0.0010 to 0.0200 %.

1.2 *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.* For specific precautionary statements, see Section 8.

2. Referenced Documents

2.1 *ASTM Standards:*

C 696 Method for Chemical, Mass Spectrometeric, and Spectrochemical Analysis of Nuclear-Grade Uranium Dioxide Powders and Pellets[2]

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications[3]

E 50 Practices for Apparatus, Reagents, and Safety Precautions for Chemical Analysis of Metals[4]

E 173 Practice for Conducting Interlaboratory Studies of Methods for Chemical Analysis of Metals[4]

E 178 Practice for Dealing with Outlying Observations[3]

3. Summary of Test Method

3.1 The specimen, contained in a small, single-use graphite crucible, is fused under a flowing carrier gas atmosphere. Hydrogen present in the sample is released as molecular hydrogen into the flowing gas stream. The hydrogen is separated from other liberated gases such as carbon monoxide and finally measured in a thermal conductivity cell.

3.2 This test method is written for use with commercial analyzers equipped to carry out the above operations automatically and is calibrated using standard samples of known hydrogen content.

4. Significance and Use

4.1 This test method is intended to test for compliance with compositional specifications. It is assumed that all who use this test method will be trained analysts capable of performing common laboratory procedures skillfully and safely. It is expected that the work will be performed in a properly equipped laboratory.

5. Interferences

5.1 The elements ordinarily present in titanium and its alloys do not interfere.

6. Apparatus

6.1 *Fusion and Measurement Apparatus*—Automatic hydrogen determinator, consisting of an electrode furnace or induction furnace; analytical gas stream impurity removal systems; thermal conductivity cell hydrogen measurement system; and auxiliary purification systems (Note 1).

NOTE 1—The apparatus and analysis system have been previously described in Method C 696, Sections 142 to 149. Several models of commercial analyzers are available and presently in use in industry. Each has its own unique design characteristics and operational requirements. Consult the instrument manufacturer's instructions for operational details.

6.2 *Graphite Crucibles*—The crucibles are machined from high-purity graphite. Use the size crucibles recommended by the manufacturer of the instrument.

6.3 *Crucible Tongs*—Capable of handling recommended crucibles.

7. Reagents and Materials

7.1 *Acetone*, low-residue.

7.2 *Sodium Hydroxide on Clay Base*, commonly known as Ascarite II.

7.3 *High-Purity Carrier Gas (99.99 %)*—Argon, nitrogen (Note 2).

NOTE 2—Carrier gases vary by instrument model and include both high-purity argon and nitrogen. Consult instrument manufacturer's instructions for proper gas selection.

7.4 *High-Purity Tin Metal (Low Hydrogen)*—Use the purity specified by the instrument manufacturer.

7.5 *Magnesium Perchlorate, Anhydrone*.

[1] This test method is under the jurisdiction of ASTM Committee E-1 on Analytical Chemistry for Metals, Ores, and Related Materials and is the direct responsibility of Subcommittee E01.06 on Ti, Zr, W, Mo, Ta, Nb, Hf.

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[2] *Annual Book of ASTM Standards*, Vol 12.01.

[3] *Annual Book of ASTM Standards*, Vol 14.02.

[4] *Annual Book of ASTM Standards*, Vol 03.05.