Designation: E 159 – 00

Standard Test Method for Hydrogen Loss of Cobalt, Copper, Tungsten, and Iron Powders[1]

This standard is issued under the fixed designation E 159; 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 covers the determination of the mass of hydrogen-reducible constituents in the following metal powders: cobalt, copper, iron, and tungsten. This test method consists of subjecting a sample of powder to the action of a hydrogen-containing gas under standard conditions of temperature and time and measuring the resulting loss of mass. This test method is useful for cobalt, copper, and iron powders in the range from 0.05 to 3.0 % oxygen and for tungsten powder in the range from 0.01 to 0.50 % oxygen. This test method does not measure the oxygen contained in oxides such as silicon oxide (SiO_2), aluminum oxide (Al_2O_3), magnesium oxide (MgO), calcium oxide (CaO), titanium dioxide (TiO_2), and so forth that are not reduced by hydrogen at the test temperatures. For total oxygen content, vacuum or inert gas fusion methods are available.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are provided for information only.

1.3 *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:*

B 215 Practices for Sampling Finished Lots of Metal Powders[2]

B 243 Terminology of Powder Metallurgy[2]

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method[3]

3. Terminology

3.1 *Definitions*—Definitions of powder metallurgy terms can be found in Terminology B 243. Additional descriptive information on powder metallurgy is available in the Related Material section of Vol 02.05 of the *Annual Book of ASTM Standards*.

4. Significance and Use

4.1 The oxygen content of a powder affects both its green and sintered properties.

4.2 Hydrogen loss is a term widely used in the powder metallurgy industry even though the measurement represents an approximate oxygen content of the powder.

4.3 Oxygen is the most common hydrogen-reducible constituent of the metal powders, and this procedure may be used as a measure of oxygen, reducible under test conditions, if other interfering elements are absent.

5. Interferences

5.1 If carbon or sulfur, or both, is present, they will be largely removed in the test. Their loss in mass is included in the total loss in mass measurement and must be subtracted from the total mass loss.

5.2 If metals or compounds are present that vaporize at the test temperature (such as cadmium, lead, zinc, and so forth), their effect is included in the loss of mass measurement and must be subtracted from the total mass loss.

5.3 If some components are present that are oxidized or hydrided during the test, there is a gain in mass that must be added to the total mass loss.

6. Apparatus

6.1 *Furnace*, capable of operating at the prescribed temperature.

6.2 *Temperature Control*, capable of maintaining temperatures to ±15°C (±27°F).

6.3 *Gastight Ceramic or Metallic Combustion Tube*.

6.4 *Flow Meter*, to measure flow of hydrogen.

6.5 *Supply of Hydrogen and Nitrogen*, having dew point lower than −40°C (−40°F).

[1] This test method is under the jurisdiction of ASTM Committee B09 on Metal Powders and Metal Powder Products and is the direct responsibility of Subcommittee B09.02 on Base Metal Powders.

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[2] *Annual Book of ASTM Standards,* Vol 02.05.

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