



Designation: E194 – 10

## Standard Test Method for Acid-Insoluble Content of Copper and Iron Powders<sup>1</sup>

This standard is issued under the fixed designation E194; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope\*

1.1 This test method<sup>2</sup> covers the determination of the mineral-acid-insoluble matter content of copper and iron powders in amounts under 1.0 %.

1.2 *This standard does not purport to address all of the safety problems, 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:*<sup>3</sup>

**B215** Practices for Sampling Metal Powders

**E50** Practices for Apparatus, Reagents, and Safety Considerations for Chemical Analysis of Metals, Ores, and Related Materials

**E691** Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

### 3. Summary of Test Method

3.1 The sample is dissolved in the appropriate acid: nitric acid ( $\text{HNO}_3$ ) for copper, hydrochloric acid ( $\text{HCl}$ ) for iron. The insoluble matter is filtered out and ignited in a furnace at 980 °C for 1 h.

### 4. Significance and Use

4.1 The purpose of this test method is to determine the amount of gangue, refractory, inert, etc., materials, that may adversely affect compacting tools and sintered properties of components formed from copper and iron powders.

<sup>1</sup> 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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<sup>2</sup> Based on the method developed by the Metal Powder Association (now the Metal Powder Producers Association of the Metal Powder Industries Federation) and described in MPIF Standard 06, "Determination of Acid Insoluble Matter in Iron and Copper Powders," which is a standard of the MPIF.

<sup>3</sup> 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.

4.2 The insoluble matter consists of those nonmetallic substances that do not dissolve in the mineral acid used to dissolve the metal. In copper powder, which is treated with nitric acid, the acid-insoluble matter includes silica, insoluble silicates, alumina, clays, and other refractory materials that may be introduced either as impurities in the raw material or from the furnace lining, fuel, etc.; lead sulfate may also be present. In iron powder, which is treated with hydrochloric acid, the insoluble matter may include carbides in addition to the substances listed above. The test method excludes insoluble material that is volatile at the ignition temperature specified.

### 5. Interferences

5.1 Any metallic tin present in the copper powder will be converted into the insoluble tin oxide by the nitric acid treatment; in such cases, provision shall be made for the determination of tin oxide and the appropriate correction applied.

### 6. Apparatus

6.1 Apparatus and reagents shall conform to the requirements prescribed in Practices E50.

6.2 *Hot Plate.*

6.3 *Muffle Furnace*, capable of operating at 980 °C.

6.4 *Casseroles (non-metallic)*, 250 mL and 750 mL.

6.5 *Glass Funnel.*

6.6 *Quart or Porcelain Crucible.*

6.7 *Desiccator.*

6.8 *Analytical Balance*, having a sensitivity of 0.1 mg.

6.9 *Filter Paper*, Whatman No. 541 or one of equivalent pore size and ash content.

6.10 *Vapor Collection System*, suitable to provide adequate operator protection from chemical vapors resulting from the acid digestion steps and muffle furnace ignition steps.

### 7. Reagents

7.1 *Hydrochloric Acid*  $\text{HCl}$  (1:1).

7.2 *Hydrochloric Acid*  $\text{HCl}$  (1:25).

7.3 *Nitric Acid* ( $\text{HNO}_3$ ).

7.4 *Nitric Acid*  $\text{HNO}_3$  (1:1).

\*A Summary of Changes section appears at the end of this standard