



Designation: E1306 – 07

Standard Practice for Preparation of Metal and Alloy Samples by Electric Arc Remelting for the Determination of Chemical Composition¹

This standard is issued under the fixed designation E1306; 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 practice covers the preparation of solid samples of reactive and refractory metals and alloys by electric arc remelting. The samples for melting may be in the form of chips, turnings, wires, and sponge. Powdered metals need to be compacted before melting.

1.1.1 This practice is also suitable for preparation of solid samples of other metals, such as steels, stainless steels, tool steels, nickel, nickel alloys, cobalt, and cobalt alloys by electric arc remelting.

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.* Specific hazard statements are given in Section 9.

2. Referenced Documents

2.1 *ASTM Standards:*²

E135 Terminology Relating to Analytical Chemistry for Metals, Ores, and Related Materials

3. Terminology

3.1 *Definitions*—For definitions of terms used in this practice, refer to Terminology **E135**.

4. Summary of Practice

4.1 Metal chips, turnings, or wires are melted into a button approximately 1¼ in. in diameter and approximately ¼-in. thick using an electric arc furnace. The action of the arc creates agitation and mixing of the molten metal which produces a homogeneous sample.

¹ This practice is under the jurisdiction of ASTM Committee **E01** on Analytical Chemistry for Metals, Ores and Related Materials and is the direct responsibility of Subcommittee **E01.20** on Fundamental Practices.

Current edition approved Jan. 15, 2007. Published January 2007. Originally approved in 1989. Last previous edition approved in 2004 as E1306 – 94 (2004). DOI: 10.1520/E1306-07.

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.

5. Significance and Use

5.1 This sampling practice is useful for converting chips, turnings, and wires taken from ingots or other solid materials into a homogeneous solid sample suitable for direct excitation on an optical emission or X-ray fluorescence spectrometer. The resultant button may itself be chipped to provide samples for plasma emission, atomic absorption, and wet chemical analysis.

5.2 This practice has been used extensively for the preparation of zirconium, zirconium alloy, titanium, and titanium alloy materials, and is applicable to other reactive, refractory, ferrous and nonferrous alloys, such as cobalt, cobalt alloys, columbium (niobium), nickel, nickel alloys, stainless steels, tantalum, tool steels, and tungsten.

6. Interferences

6.1 Test samples of known composition shall be used to determine if there is any selective volatilization or segregation of the impurity elements. Elements known to volatilize are bismuth, cadmium, chlorine, lead, magnesium, sodium, tellurium, thallium, uranium, and zinc. Other elements that may change in content are the interstitial gases, oxygen, nitrogen, and hydrogen, plus carbon, which may be added due to the graphite anode. A tungsten anode may be substituted if carbon pickup is a concern. Tungsten contamination may occur if this electrode is used. Copper contamination also may be introduced from the melting crucible.

7. Apparatus

7.1 *Electric Arc Remelt Furnace*—An apparatus suitable for this practice is shown schematically in **Fig. 1**.³ It shall be equipped as follows:

7.1.1 *Water-Cooled Upper Housing (1)*, approximately 6-in. diameter and 6¼ in. high, and having a smooth, flat sealing surface.

³ The sole source of supply of the apparatus known to the committee at this time is a commercially available unit, including expendable parts, manufactured by Cianfone Scientific Instruments Corp., Pittsburgh, PA. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which you may attend.