Designation: E 1306 – 94 (Reapproved 1998)ε1

Standard Practice for Preparation of Metal and Alloy Samples by Electric Arc Remelting for the Determination of Chemical Composition[1]

This standard is issued under the fixed designation E 1306; 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.

ε[1] NOTE—Footnote 1 was corrected in October 1998.

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:*

E 135 Terminology Relating to Analytical Chemistry for Metals, Ores, and Related Materials[2]

3. Terminology

3.1 *Definitions*—For definitions of terms used in this practice, refer to Terminology E 135.

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.

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, cadium, 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. 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.

[1] This practice 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 E01.20 on Fundamental Practices and Measurement Traceability.

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

[3] A commercially available unit, including expendable parts, manufactured by Cianflone Scientific Instruments Corp., Pittsburgh, PA, has been found satisfactory.