



Designation: **B737–10 B737 – 10 (Reapproved 2015)**

Standard Specification for Hot-Rolled and/or Cold-Finished Hafnium Rod and Wire¹

This standard is issued under the fixed designation B737; 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 specification covers hot- or cold-worked hafnium rod and wire.

1.2 This specification contains two material grades, one specifically for nuclear applications (Grade R1) and one for commercial alloying applications (Grade R3).

1.3 The products covered include the following:

1.3.1 Rod $\frac{3}{8}$ to 1 in. (9.5 to 25 mm) in diameter.

1.3.2 Wire less than $\frac{3}{8}$ in. (9.5 mm) in diameter.

1.4 Unless a single unit is used, for example, corrosion mass gain in mg/dm^2 , the values stated in either inch-pound or SI units are to be regarded separately as standard. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. SI values cannot be mixed with inch-pound values.

1.5 *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:*²

[E8 Test Methods for Tension Testing of Metallic Materials](#)

[E21 Test Methods for Elevated Temperature Tension Tests of Metallic Materials](#)

[E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications](#)

[E2626 Guide for Spectrometric Analysis of Reactive and Refractory Metals](#)

3. Terminology

3.1 *Definitions:* <https://standards.iteh.ai/catalog/standards/sist/4d91f84b-5279-4932-a5e2-8746b25da289/astm-b737-102015>

3.1.1 *rounds, flats, tubes, and wrought powder metallurgical products (single definition, common to nuclear and non-nuclear standards)*, *n*—a lot shall consist of a material of the same size, shape, condition, and finish produced from the same ingot or powder blend by the same reduction schedule and the same heat treatment parameters. Unless otherwise agreed between manufacturer and purchaser, a lot shall be limited to the product of an 8 h period for final continuous anneal, or to a single furnace load for final batch anneal.

4. Ordering Information

4.1 Purchase orders for material under this specification shall include the following information as required to adequately describe the desired material:

4.1.1 Quantity (weight or number of pieces),

4.1.2 Name of material,

4.1.3 Form (rod, wire),

4.1.4 Finish (Section 12),

4.1.5 Applicable dimensions (diameter and length),

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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.

- 4.1.6 Grade (Table 1),
- 4.1.7 ASTM designation and year of issue,
- 4.1.8 Zirconium analysis requirements (Table 1), and
- 4.1.9 Workmanship standards (Section 13).

NOTE 1—A typical ordering description is as follows: 500 lb hafnium rod, annealed; mechanically descaled and pickled; 0.375 in. diameter by 6 in. minimum random lengths; Grade R1; ASTM Specification B737 - 01.

4.2 In addition to the data specified in 4.1, the following options and points of agreement between the manufacturer and the purchaser shall be specified on the purchase order if required:

- 4.2.1 Mechanical test temperature (see 8.1),
- 4.2.2 Mechanical test requirements for Grade R3 (Section 8),
- 4.2.3 Straightness (Table 2),
- 4.2.4 Special tests (Section 11),
- 4.2.5 Inspection (Section 16),
- 4.2.6 Hafnium isotopic composition and its analysis, (Table 1),
- 4.2.7 Metallurgical condition (Section 6),
- 4.2.8 Corrosion test Grade 3 (9.3),
- 4.2.9 Rejected material return (Section 17), and
- 4.2.10 Certification requirements (Section 19).

5. Materials and Manufacture

5.1 Material covered by this specification shall be made by conventional hot and cold working procedures, from ingots produced by vacuum melting in electron beam or consumable arc furnaces, or both, of a type conventionally used for reactive metals.

6. Metallurgical Condition

6.1 All grades furnished under this specification shall be in the recrystallization annealed condition unless otherwise specified.

7. Chemical Composition

7.1 The material shall conform to the requirements for chemical composition as prescribed in Table 1.

7.2 The manufacturer's manufacturer's ingot analysis shall be considered the chemical analysis for material produced to this specification except for hydrogen and nitrogen content which shall be determined on the finished product.

7.3 Analysis shall be made using the manufacturer's manufacturer's standard methods.

TABLE 1 Chemical Requirements — Maximum Impurity Level

| Element | Composition, Weight % | |
|----------------------|---------------------------|--------------|
| | Alloying Grade | |
| | Nuclear Grade Grade R1 | Grade R3 |
| Aluminum | 0.010 | 0.050 |
| Carbon | 0.015 | 0.025 |
| Chromium | 0.010 | 0.050 |
| Copper | 0.010 | ... |
| Hydrogen | 0.0025 | 0.0050 |
| Iron | 0.050 | 0.0750 |
| Molybdenum | 0.0020 | ... |
| Nickel | 0.0050 | ... |
| Niobium | 0.010 | ... |
| Nitrogen | 0.010 | 0.0150 |
| Oxygen | 0.040 | 0.130 |
| Silicon | 0.010 | 0.050 |
| Tantalum | 0.020 | ... |
| Tin | 0.0050 | ... |
| Titanium | 0.010 | 0.050 |
| Tungsten | 0.0150 | 0.0150 |
| Uranium | 0.0010 | ... |
| Vanadium | 0.0050 | ... |
| Zirconium | ^A | ^A |
| Hafnium ^B | balance | balance |

^A Zirconium shall be reported. Acceptable levels shall be established by mutual agreement between purchaser and producer.

^B Hafnium isotopic composition and analytical methods, if required, shall be mutually agreed upon by the purchaser and producer.