



Designation: B652/B652M – 04

Standard Specification for Niobium-Hafnium Alloy Ingots¹

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1. Scope

1.1 This specification covers hafnium alloyed niobium ingots prepared by vacuum- or plasma- arc melting or electron-beam furnace melting, or a combination of these methods, to produce consolidated metal for processing to various mill shapes.

1.2 The material covered by this specification is Grade R04295, niobium-base alloy containing approximately 10 % hafnium and 1 % titanium.

1.3 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.

2. Referenced Documents

2.1 *ASTM Standards*:²

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

3. Ordering Information

3.1 Orders for material under this specification shall include the following information as applicable:

3.1.1 General alloy description (see 1.2) and ASTM designation and year of issue,

3.1.2 Quantity in weight or pieces,

3.1.3 Size: diameter and length,

3.1.4 Chemistry (Section 5),

3.1.5 Quality and finish (see 7.2, 7.4, and 7.6),

3.1.6 Certifications and Reports (Section 13),

3.1.7 Packaging (Section 15), and

¹ This specification is under the jurisdiction of ASTM Committee B10 on Reactive and Refractory Metals and Alloys and is the direct responsibility of Subcommittee B10.03 on Niobium and Tantalum.

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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.

3.1.8 Disposition of rejected material (Section 11).

4. Materials and Manufacture

4.1 The ingot metal for this material may be vacuum- or plasma-arc melted, electron-beam melted, or a combination of these methods.

5. Chemical Composition

5.1 The material shall conform to the requirements as to chemical composition prescribed in Table 1. Analysis for elements, not listed in Table 1 and not normally expected in niobium hafnium alloy, shall not be required unless specified at time of purchase.

6. Permissible Variations in Quantity

6.1 For orders requiring up to 100 lb [45 kg] of ingots, the manufacturer may overship up to a maximum of 20 %. For orders up to 1000 lb [450 kg], the manufacturer may overship up to a maximum of 10 %. The permissible overshipment shall be negotiated for orders larger than 1000 lb [450 kg].

7. Workmanship, Finish, and Appearance

7.1 The manufacturer shall use care to have each lot of ingot material as uniform in quality as possible.

7.2 When specified, the ingots shall be conditioned on the surface to standards agreed upon between the purchaser and the manufacturer.

7.3 In the conditioned ingot, no abrupt changes in diameter or local depressions that will impair subsequent fabrication will be permitted. The difference between maximum and minimum radius of the conditioned ingot shall not exceed 5 % of the maximum radius. Lands, grooves, and local depressions shall be blended to a maximum angle of 30° to the axis of the ingot.

7.4 Each ingot should be tested for soundness by nondestructive test methods, such as dye penetrant and ultrasonic tests, as mutually agreed upon between the purchaser and the manufacturer.

7.5 Defects in ingots that exceed the acceptance standards shall be removed by cropping or surface conditioning, whichever is appropriate. The manufacturer shall be permitted to