Designation: B 495 – 90 (Reapproved 2000)

Standard Specification for Zirconium and Zirconium Alloy Ingots[1]

This standard is issued under the fixed designation B 495; 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 four grades of zirconium ingots.

1.2 The values stated in inch-pound units are to be regarded as the standard. The SI units given in parentheses are for information only.

1.3 The following precautionary caveat pertains only to the test method portion, Section 9, of this specification: *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:*

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications[2]

E 114 Practice for Ultrasonic Pulse-Echo Straight-Beam Examination by the Contact Method[3]

3. Classification

3.1 The ingots are furnished in five grades as follows:

3.1.1 *Grade R60702*— Unalloyed zirconium.

3.1.2 *Grade R60703*— Unalloyed zirconium, metallurgical grade.

3.1.3 *Grade R60704*— Zirconium-tin alloy.

3.1.4 *Grade R60705*— Zirconium-niobium alloy.

3.1.5 *Grade R60706*— Zirconium-niobium alloy.

4. Ordering Information

4.1 Orders for materials under this specification shall include the following information:

4.1.1 Quantity (weight),

4.1.2 Name of material (zirconium ingot),

4.1.3 Grade number (Section 3),

4.1.4 ASTM designation and year of issue,

4.1.5 Finish (Section 7), and

4.1.6 Additions to the specification and supplementary requirements, if required.

NOTE 1—A typical ordering description is as follows: 10 000-lb zirconium ingot, machine conditioned, ASTM B495, dated __, Grade R60702.

5. Materials and Manufacture

5.1 The ingots covered by this specification shall be manufactured by electron beam, vacuum, or inert atmosphere melting in furnaces conventionally used for reactive metals.

6. Chemical Composition

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

6.2 When requested by the purchaser, a check analysis shall be performed for any elements listed in Table 1.

6.2.1 The manufacturer's analysis shall be considered as verified if the check analysis confirms the manufacturer's reported values within the tolerances prescribed in Table 2.

7. Workmanship, Finish, and Appearance

7.1 Ingots shall be conditioned by machining, grinding, or surface fusion to remove gross surface and subsurface defects detrimental to subsequent fabrication.

7.2 After conditioning has been completed, no abrupt changes in diameter or local depressions that will impair subsequent fabrication shall be permitted. The difference between the maximum and minimum radii of the conditioned ingot shall not exceed 20 % of the maximum radius, except within 6 in. (150 mm) of the ends of the ingot where rounding is permissible. Lands, grooves, and local depressions shall be blended to a maximum angle of 30° to the axis of the ingot. Each end of the ingot shall be chamfered or radiused. The minimum chamfer or radius shall be ½ in. (12.7 mm).

8. Number of Tests and Retests

8.1 At least one sample from the top, middle, and bottom of each ingot shall be analyzed chemically.

8.2 An ultrasonic test shall be conducted on each ingot.

8.3 *Retests*:

8.3.1 If any sample or specimen exhibits obvious contamination, improper preparation, or flaws disqualifying it as a representative sample, it should be discarded and a new sample or specimen substituted.

[1] This specification is under the jurisdiction of ASTM Committee B10 on Reactive and Refractory Metals and Alloysand is the direct responsibility of Subcommittee B10.02 on Zirconium and Hafnium.

Current edition approved Dec. 28, 1990. Published February 1991. Originally published as B 495–69. Last previous edition B 495–79 (1984).

[2] *Annual Book of ASTM Standards*, Vol 14.02.

[3] *Annual Book of ASTM Standards*, Vol 03.03.