



Standard Specification for Zirconium Sponge and Other Forms of Virgin Metal for Nuclear Application¹

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1. Scope

1.1 This specification covers virgin zirconium metal commonly designated as sponge because of its porous, sponge-like texture, but it may also take other forms such as chunklets.

1.2 One grade is described which is designated as Reactor Grade R60001, suitable for use in nuclear application. The most important characteristic of the reactor grade is its low nuclear cross section as achieved by removal of hafnium and by careful quality control in manufacturing procedures to prevent contamination with other high cross-section materials.

1.3 Unless a single unit is used, for example corrosion mass bain in $\text{mg}\cdot\text{dm}^2$, 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.

1.4 The following precautionary caveat pertains only to the test method portions 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 Specifications²

3. Ordering Information

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

- 3.1.1 Quantity,
- 3.1.2 Name of material,
- 3.1.3 Grade designation, and
- 3.1.4 ASTM designation and year of issue.

NOTE 1—A typical ordering description is as follows: 5000 lb (2000 kg)

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² Annual Book of ASTM Standards, Vol 14.02.

reactor grade zirconium, Grade R60001, ASTM Specification B 349 – ..

3.2 In addition to the data specified in 3.1, the following options and points of agreement between the manufacturer and the purchaser shall be specified in the purchase order, if required.

- 3.2.1 Packaging (Section 14), and
- 3.2.2 Duplicate samples (see 6.2).

4. Materials and Manufacture

4.1 Zirconium metal is usually prepared by reduction of zirconium tetrachloride, and gets its physical characteristics from the processes involved in production. These characteristics may be expected to vary greatly with manufacturing methods. This specification, however, is not limited to metal prepared by reduction of tetrachloride or to material of any specific physical form.

4.2 Only virgin zirconium metal, in identified, uniform, well-mixed blends, shall be supplied under this specification.

5. Chemical Composition

5.1 The zirconium metal supplied under this specification shall conform to the requirements for chemical composition prescribed in Table 1.

6. Sampling

6.1 A blend of sponge shall be sampled by running a full quantity through a proportioner or splitter to obtain a representative sample of at least 1 % of the blend weight. The method for splitting this sample and preparing an evaluation ingot and compacted briquette shall be agreed upon between the manufacturer and the purchaser. One such method is by splitting using a Jones riffle.

6.1.1 The evaluation ingot shall be greater than 30 lb (14 kg).

6.1.2 The compacted briquette shall be at least 1 lb (0.5 kg).

6.2 When specified in the purchase order, a duplicate sample or portions of the briquette and evaluation ingot shall be supplied to the purchaser.

7. Methods of Chemical Analysis

7.1 Preparation of Sample:

7.1.1 Compact the evaluation ingot sample taken in accordance with Section 6 into a consumable electrode and melt to ingot form in an arc furnace of a type conventionally used for