



Designation: B 614 – 95 (Reapproved 2000)

Standard Practice for Descaling and Cleaning Zirconium and Zirconium Alloy Surfaces¹

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1. Scope

1.1 This practice covers a cleaning and descaling procedure useful to producers, users, and fabricators of zirconium and zirconium alloys for the removal of ordinary shop soils, oxides, and scales resulting from heat treatment operations and foreign substances present as surface contaminants.

1.2 It is not intended that these procedures become mandatory for removal of any of the indicated soils but rather serve as a guide when zirconium and zirconium alloys are being processed in the wrought, cast, or fabricated form.

1.3 It is the intent that these soils be removed prior to chemical milling, joining, plating, fabrication, and in any situation where foreign substances interfere with the corrosion resistance, stability, and quality of the finished product.

1.4 The values stated in inch-pound units are to be regarded as the standard.

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.* For specific hazard statements, see Section 6.

2. Processing Soil Removal

2.1 Grease, oil, and lubricants employed in machining, forming, and fabricating operations on zirconium and zirconium alloys should be removed by employing one of the methods or a combination of methods as listed: (1) alkaline or emulsion soak-type cleaners, (2) ultrasonic cleaning, (3) acetone or trichloroethylene solvent washing or vapor degreasing, or (4) electrolytic alkaline cleaning system. In the electrolytic system, the work can be either anodic or cathodic polarity provided voltage and current density are controlled to avoid anodizing. Removal of these soils is recommended prior to heat treatment or application of acid treatment designated in

4.2.3. When electrolytic systems are employed, the voltage should be controlled to prevent the occurrence of spark discharge and subsequent pitting.

3. Blast Cleaning

3.1 Mechanical descaling methods such as sandblasting, shot blasting, and vapor blasting may be used to remove hot work scales and lubricants from zirconium surfaces if followed by thorough conditioning and cleaning as described in Section 4.

3.2 Aluminum oxide, silicon carbide, silica sand, zircon sand, and steel grit are acceptable media for mechanical descaling. Periodic replacement of used media may be required to avoid excessive working by dull particulate.

3.3 Roughening of exposed surface areas may occur from grit or shot if cleaning of the entire surface is accomplished by blasting. Partial cleaning for preserving the surface finish is to be preferred in conjunction with proper pickling procedures.

3.4 Any abrasive or shot blast cleaning may induce residual compressive stresses in the surface of the material or zirconium structure. Warpage may occur in sections that are subsequently chemical milled or contour machined.

3.5 In most cases, blast cleaning is not intended to eliminate pickling procedures completely. However, there are cases where blast cleaning does not need to be followed by a pickling operation. Abrasives may not remove surface layers contaminated with interstitial elements such as carbon, oxygen, hydrogen, and nitrogen. When these elements are present in excessive amounts, they are preferably removed by controlled acid pickling in accordance with 4.3.

4. Pickling and Descaling

4.1 Recommended post treatment of shot or abrasive blasted zirconium surfaces may include acid pickling as described in 4.3 to ensure complete removal of metallic iron, oxide, scale, and other surface contaminants.

4.2 Scale and lubricant residues developed on mill, foundry, forged, or fabricated zirconium products usually require conditioning by one of the following commercial methods prior to final pickling as described in 4.3 to produce a completely scale-free surface.

¹ This practice is under the jurisdiction of ASTM Committee B10 on Reactive and Refractory Metals and Alloys and is the direct responsibility of Subcommittee B10.02 on Zirconium and Hafnium.

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