



Standard Test Method for Seal Quality of Anodic Coatings on Aluminum by Acid Dissolution¹

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1. Scope

1.1 This test method covers a test for the quality of seal of porous anodic coatings on aluminum and its alloys. It is based upon the loss in mass of the coating after immersion in a warm phosphoric-chromic acid solution.

1.2 This test method is applicable to anodic coatings intended for exposure to the weather, or for protective purposes in corrosive media, and where resistance to staining is important.

1.3 This test method is not applicable to:

1.3.1 Hard coatings, which normally are not sealed.

1.3.2 Anodic coatings that have been sealed only in dichromate solutions.

1.3.3 Anodic coatings that have undergone a treatment to render them hydrophobic.

1.4 *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:*

B 137 Test Method for Measurement of Coating Mass Per Unit Area on Anodically Coated Aluminum²

D 1193 Specification for Reagent Water³

2.2 *International Standard:*

ISO 3210 Anodizing of Aluminum and Its Alloys—Assessment of Sealing Quality by Measurement of the Loss of Mass After Immersion in Phosphoric-Chromic Acid Solution⁴

3. Significance and Use

3.1 This test method describes a destructive test procedure for measuring the degree of seal of the porosity in anodic oxide

coatings. Low coating mass loss is an indication of good seal quality and of the ability of the coating to resist staining and “blooming” in many types of service.

3.2 This test method is suitable for quality control purposes within manufacturing operations and for determining whether anodized parts meet seal quality requirements in applicable specifications.

4. Apparatus

4.1 *Laboratory Balance*, accurate to 1 mg.

4.2 *Glass Container*, means of heating and stirring, and a thermometer. There shall be no metal in contact with the test specimen or the solution.

5. Acid Test Solution

5.1 The test solution shall have the following makeup:

Chromic acid anhydride (CrO_3)	20 \pm 0.5 g
Orthophosphoric acid of 85 mass %, density 1.69	35 \pm 0.5 mL
Distilled or deionized water conforming with Type III Reagent Water of Specification D 1193, to make up to	1000 mL

NOTE 1—This solution is commonly referred to as a “stripping solution” for anodic coatings and is of the same composition as that employed in Method B 137. This solution dissolves the anodic coating with no significant attack of the substrate metal.

5.2 The test solution may be used repeatedly but shall be discarded after 1 g of anodic coating has been dissolved per litre of solution.

NOTE 2—The solution may be used for as many as 20 test specimens per litre provided that the average mass loss does not exceed 50 mg per specimen.

6. Preparation of Test Specimen

6.1 Select an uncontaminated specimen having an area about 1 dm² of the anodized surface to be tested.

6.2 The mass of the specimen shall not exceed 200 g.

6.3 When it is desired to conduct the test on one face only of the specimen, the anodic coating on the other surface is removed by a chemical or mechanical process, leaving the significant face intact.

6.4 Bare, cut edges and other uncoated surfaces of the specimen shall be left bare and shall not be given a protective coating.

¹ This test method is under the jurisdiction of ASTM Committee B-8 on Metallic and Inorganic Coatings and is the direct responsibility of Subcommittee B08.07 on Chemical Conversion Coatings.

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² *Annual Book of ASTM Standards*, Vol 02.05.

³ *Annual Book of ASTM Standards*, Vol 11.01.

⁴ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

7. Procedure

7.1 Measure the area (A) in square decimetres of the coating without including cut edges or other uncoated surfaces.

7.2 Weigh the specimen to the nearest 1 mg (W_1).

7.3 Immerse the specimen for 15 ± 0.1 min in the stirred acid test solution maintained at a temperature of $38 \pm 1^\circ\text{C}$.

7.4 Remove the specimen and wash thoroughly in deionized or distilled water conforming with Type III reagent water of Specification D 1193.

7.5 Dry the specimen with clean compressed air, or allow it to air-dry.

7.6 Reweigh the specimen to the nearest 1 mg (W_2).

7.7 When it is desired to express the mass loss in the test as a percent of the total coating mass, use the above procedure followed by stripping the remainder of the oxide in the phosphoric-chromic acid solution in accordance with Method B 137.

7.8 Rinse and dry the specimen as above and reweigh it to the nearest 1 mg (W_3).

8. Report

8.1 Report the mass loss per square decimetre calculated as follows:

$$\text{Mass Loss, mg/dm}^2 = \frac{(W_1 - W_2)}{A} \quad (1)$$

8.2 When required, report the mass loss in the test as a percent of the total coating mass, calculated as follows:

$$\text{Coating Dissolved in Test, \%} = \frac{W_1 - W_2}{W_1 - W_3} \times 100 \quad (2)$$

9. Precision and Bias

9.1 The precision and accuracy of coating mass loss per unit area are most affected by the accuracy of measurement of the area of the anodized surface. When smooth, flat rectangular test specimens of sheet are used, the reproducibility of test results among experienced operators is usually within ± 2 mg/dm², or ± 10 % of the arithmetic mean of the test values, whichever is greater.

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