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AMERICAN SOCIETY FOR TESTING AND MATERIALS  
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# **Standard Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Transparent Coatings on Opaque Surfaces Using the Light-Section Microscope<sup>1</sup>**

This standard is issued under the fixed designation B 681; 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 test method covers a procedure for the nondestructive measurement of the thickness of transparent anodic coatings on aluminum articles by means of the light-section microscope. This method may also be used to measure the thickness of any transparent coating on an opaque reflective surface.

1.2 *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 244 Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments<sup>2</sup>

B 487 Test Method for Measurement of Metal and Oxide Coating Thicknesses by Microscopical Examination of a Cross Section<sup>2</sup>

B 588 Test Method for Measurement of Thickness of Transparent or Opaque Coatings by Double-Beam Interference Microscope Technique<sup>2</sup>

### **2.2 International Standard:**

ISO 2128 Anodizing of Aluminum and Its Alloys—Determination of Thickness of Anodic Oxide Coatings—Nondestructive Measurement by Split-Beam Microscope<sup>3</sup>

## **3. Summary of Test Method**

3.1 The thickness of a transparent anodic coating or other transparent coating is determined by a microscopical method in which a thin beam of light is projected on to the specimen surface at an angle of 45° to the normal. The displacement between the rays reflected from the coating surface and from

the coating-substrate interface is measured and is directly related to the coating thickness.

## **4. Significance and Use**

4.1 The test method describes a rapid and nondestructive procedure for measuring the coating thickness of anodic oxides on aluminum and of other transparent coatings on opaque reflecting surfaces.

4.2 This test method is suitable for quality control purposes within manufacturing operations and for determining whether coated parts meet coating thickness requirements provided in applicable specifications.

4.3 The test method is limited by the following restrictions:

4.3.1 The coating must be sufficiently transparent to allow the light from the instrument to reflect off the coating-substrate interface and be visible as a distinct line.

4.3.2 Both the coating and substrate must be sufficiently smooth to allow the beams of light to reflect from the coating surface and the coating-substrate interface without significant distortion or aberration and to be clearly visible.

4.3.3 The index of refraction of the coating material must be known.

4.3.4 The coating must be in the thickness range of 2 to 40 μm.

4.4 This test method is suitable for most clear anodic coatings on aluminum articles used in interior or exterior applications for decorative or protective purposes. It is applicable to coatings that have been dyed if the depth of color is not so great as to obscure the coating-substrate interface. It is also applicable to some transparent organic coatings such as clear or dyed lacquers, provided that their thickness and uniformity fall within the guidelines given above.

4.5 This test method is not suitable for barrier layer anodic coatings, integral color coatings except in the lightest colors, hard anodic coatings, or some specialty types of coatings that are too thin, thick, or rough. Other methods such as the eddy-current technique, Test Method B 244, cross-section technique, Test Method B 487, and interference microscope technique, Test Method B 588, may be applicable to coatings on which the light-section microscope cannot be used.

## **5. Lacquered Anodic Coatings**

5.1 This test method will not give accurate anodic coating

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee B-8 on Metallic and Inorganic Coatings and is the direct responsibility of Subcommittee B08.10 on General Test Methods.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 02.05.

<sup>3</sup> Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.