



Designation: ~~D480 – 88 (Reapproved 2008)~~ D480 – 88 (Reapproved 2014)

## Standard Test Methods for Sampling and Testing of Flaked Aluminum Powders and Pastes<sup>1</sup>

This standard is issued under the fixed designation D480; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the U.S. Department of Defense.*

### 1. Scope

1.1 These test methods cover procedures for sampling, qualitative analysis, and physical testing of flaked aluminum powders and pastes (leafing and nonleafing) for coatings.

1.2 These test methods apply equally to leafing and nonleafing flaked aluminum powders and pastes except where noted to the contrary.

1.3 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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.* For a specific hazard statement, see [7.3.1](#).

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

[D185 Test Methods for Coarse Particles in Pigments](#)

[D235 Specification for Mineral Spirits \(Petroleum Spirits\) \(Hydrocarbon Dry Cleaning Solvent\)](#)

[D329 Specification for Acetone](#)

[D962 Specification for Aluminum Powder and Paste Pigments for Paints](#)

[D3980 Practice for Interlaboratory Testing of Paint and Related Materials](#) (Withdrawn 1998)<sup>3</sup>

[E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves](#)

[E34 Test Methods for Chemical Analysis of Aluminum and Aluminum-Base Alloys](#)

[E607 Test Method for Atomic Emission Spectrometric Analysis Aluminum Alloys by the Point to Plane Technique Nitrogen Atmosphere](#) (Withdrawn 2011)<sup>3</sup>

[E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method](#)

### 3. Significance and Use

3.1 Flaked aluminum pigments are produced in a variety of forms. These test methods allow the user to determine the applicability of a given product to this use.

### 4. Sampling

4.1 Sampling is subject to mutual agreement between the seller and the purchaser. Place each sample in a clean, dry metal or glass container which shall be nearly filled, then close with a tight cover, seal, mark, and send to the laboratory for testing.

4.2 When requested, duplicate samples may be taken from the same container and delivered to the seller, and the inspector may take a third set of samples to hold for test in case of disagreement.

<sup>1</sup> These test methods are under the jurisdiction of ASTM Committee [D01](#) on Paint and Related Coatings, Materials, and Applications and are the direct responsibility of Subcommittee [D01.31](#) on Pigment Specifications.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](#), or contact ASTM Customer Service at [service@astm.org](#). For *Annual Book of ASTM Standards* volume information, refer to the [standard's Document Summary](#) page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](#).

5. Qualitative Analysis

5.1 *Significance and Use*—This test method determines if there are chemical impurities, other than fatty and oily matter, as specified in Specification D962, to ensure the absence of fillers or extender pigments.

5.2 Procedure:

5.2.1 *Total Impurities*—Determine the total impurities by weight in accordance with Test Methods E34 and E607 or by atomic absorption.

5.2.2 *Total Aluminum*—Determine the total aluminum by weight difference with elemental impurities in accordance with 5.2.1.

6. Leafing Properties

6.1 The leafing test conditions specified are selected arbitrarily, and even though the numerical leafing value obtained by this test method appears to be low, the pigment may give substantially perfect leafing under the conditions of practical application in a paint.

6.2 *Significance and Use*—This leafing test method has been established to determine the percent of leafed aluminum flakes at the surface of a simulated paint formula to ensure a bright metallic luster. Minimum leafing characteristics must conform to Specification D962.

6.3 Apparatus:

6.3.1 *Leafing Spatula*, nonmagnetic, stainless steel spatula having the following dimensions:

Length of blade min, in. (mm)	5.5 (139.7)
Width of blade, in. (mm)	0.540 ± 0.002 (13.72 ± 0.05)
Thickness of blade, in. (mm):	
10 mm from tip	0.013 ± 0.003 (0.33 ± 0.08)
100 mm from tip	0.038 ± 0.004 (0.97 ± 0.10)
Shape of tip	rounded or straight

The surface of the spatula shall be polished with 3/0 emery or silicon carbide metallographic paper wet with mineral spirits; polishing shall be repeated for 1-min intervals until a consistent minimum leafing result is obtained in a typical leafing test.

6.3.2 *Test Tube*, 152 mm (6 in.) in length by 19.0 mm (0.75 in.) in diameter.

6.3.3 *Glass Cylinder*, 203 mm (8 in.) in length and 38.1 to 50.8 mm (1.5 to 2.0 in.) in inside diameter. A stopper shall be used and the spatula shall be attached to the stopper so as to hang vertically in the cylinder with the tip about 25 mm (1 in.) from the bottom.

6.4 Reagents:

6.4.1 *Coumarone-Idene Resin*—The form commercially known as “chipped” and having the following properties:

Specific gravity	109 to 117
Acid value, max	1.12 to 1.16
Cloud point, °C, max	0.5
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6.4.2 *Petroleum Spirits*—Conforming to Specification D235 and having the following additional properties:

Specific gravity at 16°C (60°F)	0.800 to 0.810
Surface tension at 21°C (70°F), N/m, min	24.5
Kauri butanol value	42 to 44
Aniline point, °C (°F)	40 to 45 (105 to 115)

6.5 *Preparation of Leaf-Testing Vehicle*—Prepare solution by dissolving 30.0 g of resin, in the form of small chips, in 100 mL of petroleum spirits, while heating gently at about 60°C (140°F). The specific gravity of the solution shall be between 0.877 and 0.881 at 16°C (60°F). Allow the solution to settle and retain the clear portion for use.

6.6 *Aliquot*—Unless otherwise specified, the aliquot weight shall be as follows:

Classification	ASTM Designation	Class	Aliquot Weight, g
Flaked aluminum powder	D962, Type 1	A	1.0
		B	1.0
		C	2.0
Aluminum paste	D962, Type 2	A	1.5
		B	1.5
		C	3.0

6.7 *Procedure*—Perform the test at a room temperature of 25 ± 2°C. Place approximately 5 mL of the leaf-testing vehicle in the glass cylinder and cover with a watch glass. Transfer 25.0 ± 1.0 mL of the vehicle to a clean container. Weigh the required aliquot of aluminum powder or paste to the nearest 0.01 g and transfer to a small dish. Add about 2.5 mL of the 25-mL quantity of vehicle and mix to a stiff paste with a spatula or small stiff brush. Add approximately 5 mL more of the vehicle and stir to a smooth mixture, then add the remainder of the vehicle and continue stirring to obtain complete dispersion. Transfer the mixture to the test tube to give a depth of about 110 mm when the specified spatula is immersed. Avoid formation of bubbles. Dip the