Designation: D 3619 – 77 (Reapproved 1996)$^{\epsilon 1}$

An American National Standard

AMERICAN SOCIETY FOR TESTING AND MATERIALS
100 Barr Harbor Dr., West Conshohocken, PA 19428
Reprinted from the Annual Book of ASTM Standards. Copyright ASTM

Standard Specification for Aluminum Silicate Pigments (Anhydrous)[1]

This standard is issued under the fixed designation D 3619; 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.

ϵ^1 NOTE—Keywords were added editorially in May 1996.

1. Scope

1.1 This specification covers the white pigments that consist substantially of anhydrous (calcined) natural aluminum silicates[2] (of the 1+1 layer type) and are restricted to those minerals which conform to the chemical compositional limits prescribed herein and which can be suitably processed to what is known as paint pigment quality.

2. Referenced Documents

2.1 *ASTM Standards:*

D 281 Test Method for Oil Absorption of Pigments by Spatula Rub-Out[3]

D 718 Test Methods for Analysis of Aluminum Silicate Pigment[4]

D 1203 Test Methods for Volatile Loss from Plastics Using Activated Carbon Methods[5]

D 1483 Test Method for Oil Absorption of Pigments by Gardner-Coleman Method[3]

D 2448 Test Method for Water-Soluble Salts in Pigments by Measuring the Specific Resistance of the Leachate of the Pigment[4]

D 3360 Test Method for Particle Size Distribution by Hydrometer of the Common White Extender Pigments[4]

E 70 Test Method for pH of Aqueous Solutions with the Glass Electrode[6]

3. Composition and Properties

3.1 *Preparation*—The pigment shall be made by grinding, milling, washing, purifying, or otherwise processing, natural hydrous aluminum silicates followed by heat treatment (calcination) sufficient to reduce the residual percent loss on ignition to a maximum of 0.5 % and otherwise conforming to the composition requirements (weight percent) given in Table 1.

3.2 *pH*—The pH of a water slurry of the pigment shall be within a range from 4.5 to 5.5 unless otherwise agreed upon between the purchaser and the seller.

TABLE 1 Pigment Composition Requirements
(Percent by Weight)

NOTE 1—The major constituents shown in the analysis are combined as complex aluminum silicate and do not exist as free oxides.

	Ideal	Typical	Range	Max
Aluminum oxide, Al_2O_3, %	45.91	44.4	43-49[A]	...
Silicon dioxide, SiO_2, %	54.09	52.3	56-50[B]	...
Iron oxide, Fe_2O_3, %	...	0.1		0.
Titanium dioxide, TiO_2, %	...	2.0		2.5
Calcium oxide, CaO, %	...	...		0.1
Sodium oxide, Na_2O, %	...	...		0.1
Potassium oxide, K_2O, %	...	...		0.1
Other oxides, %	...	...		0.1
Free moisture (105°C), %	...	<0.5		0.5
Loss on ignition (1000°C), %	...	<0.5		0.5
Free silica (either amorphous or as crystalline quartz), %				1.0

[A] Permitting up to about 5 % excess Al_2O_3, for example, as allophane.
[B] Permitting up to about 5 % excess SiO_2, for example, but no more than 1 % of free silica (SiO_2) either amorphous or as crystalline quartz.

3.3 *Water-Soluble Matter*—The water-soluble matter shall be not more than 0.60 %.

3.4 *Wet-Sieve Residue*—The pigment shall contain no more than 0.02 % wet-sieve residue retained on a 45 µm (No. 325) sieve (grit or coarse particles) except as may be agreed upon between the purchaser and the seller.

3.5 *Brightness (Color)*—The brightness (color reflectance) shall conform to the following requirements:

3.5.1 The brightness shall be not less than 90 % nor more than 92 % expressed as percent reflectance of standard illuminant C at 457 nm compared to a freshly smoked magnesium oxide surface by means of an accepted integrating sphere reflectance spectrophotometer or a monochromatic reflectance meter, or

3.5.2 The color may be specified by actual determination of dominant wavelength, hue, and spectral efficiency as can be calculated from the tristimulus integration of the reflectance curve, or

3.5.3 The color shall be equal, within agreed upon tolerances, to that of a reference standard agreed upon between the purchaser and the seller.

3.6 *Oil Absorption*—The oil absorption shall be within the range from 40 to 60 g/100 g as determined by the spatula rub-out test (Test Method D 281) or within a range from 60 to 80 g/100 g as determined by the Gardner-Coleman test method

[1] This specification is under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.31 on Pigment Specification.
Current edition approved Nov. 10, 1977. Published January 1978.
[2] Synonymous terms are kaolinite and china clay.
[3] *Annual Book of ASTM Standards*, Vol 06.01.
[4] *Annual Book of ASTM Standards*, Vol 06.03.
[5] *Annual Book of ASTM Standards*, Vol 08.01.
[6] *Annual Book of ASTM Standards*, Vol 15.05.

(Test Method D 1483) (see 5.1.4). It may be noted that reproducible test results using the spatula rub-out test method (Test Method D 281) are found to be very difficult to obtain because of a very high electrostatic charge imparted to the anhydrous pigment during the rub-out procedure. Although a spatula rub-out test result can be obtained, it has been found by experience that much more reproducible results can be obtained by use of the Gardner-Coleman test method.

3.7 *Particle Size*—Anhydrous aluminum silicate pigments may be furnished in several types or grades whose properties are dependent in part on the average particle size or particle size distribution about the average, or both; characteristic particle shape is as thin, flat, and laminated plates. The particle size or size distribution, or both, shall be within agreed upon tolerances to that of a standard agreed upon between the purchaser and the seller, but in general, the average particle size should be close to 2 µm.

4. Sampling

4.1 Two samples shall be taken at random from different packages of each lot, batch, day's pack, or other unit of production in the shipment. When no markings distinguishing between units of production appear, samples shall be taken from different packages in the ratio of two samples for each 10 000 lb, except that for shipments of less than 10 000 lb, two samples shall be taken. At the option of the purchaser, the samples may be tested separately or after blending the samples from the same production unit in equal quantities to form a composite sample.

5. Test Methods

5.1 Tests shall be conducted in accordance with the appropriate ASTM test methods, where applicable. Test procedures not covered by ASTM test methods shall be agreed upon between the purchaser and the seller, except as follows:

5.1.1 *Hydrogen Ion Concentration* (pH)—Prepare a sample having 20 % solids, but otherwise in accordance with Test Methods D 1203. Determine the pH in accordance with Test Method E 70, except maintain sufficient agitation of the slurry such that all particles are in suspension at the time of measurement.

5.1.2 *Water-Soluble Matter*—Test Method D 2448.

5.1.3 *Coarse Particles*—Test Methods D 718.

5.1.4 *Oil Absorption*—Test Methods D 281 or D 1483.

5.1.5 *Particle Size Distribution*—Test Method D 3360.

5.1.6 *Chemical Analysis*—Test Methods D 718.

6. Keywords

6.1 aluminum; aluminum oxide; aluminum silicate; calcination; hydrous aluminum silicate; pigment; silicon dioxide