



# Standard Specification for Aluminum Silicate Pigments (Hydrous)<sup>1</sup>

This standard is issued under the fixed designation D 603; 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.

<sup>ε1</sup> NOTE—Keywords were added editorially in May 1996.

## 1. Scope

1.1 This specification covers the white pigments that consist substantially of natural hydrous aluminum silicate<sup>2</sup> (of the 1:1 layer type), and are restricted to those minerals which conform to the chemical limits prescribed herein and which can be suitably processed to what is commercially 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<sup>3</sup>
- D 422 Test Method for Particle-Size Analysis of Soils<sup>4</sup>
- D 718 Test Methods for Analysis of Aluminum Silicate Pigment<sup>5</sup>
- D 1208 Test Methods for Common Properties of Certain Pigments<sup>5</sup>
- D 1483 Test Method for Oil Absorption of Pigments by Gardner-Coleman Method<sup>3</sup>
- D 2448 Test Method for Water-Soluble Salts in Pigments by Measuring the Specific Resistance of the Leachate of the Pigment<sup>5</sup>
- E 70 Test Method for pH of Aqueous Solution with the Glass Electrode<sup>6</sup>

## 3. Composition of Properties

3.1 *Preparation*—The pigment shall be made by grinding, milling, washing, purifying, size-fractionating, or otherwise processing, natural hydrous aluminum silicates, and shall conform 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 as agreed upon between the purchaser and the seller.

<sup>1</sup> 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 Specifications.

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<sup>2</sup> Synonymous terms are china clay and kaolinite.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 06.01.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 04.08.

<sup>5</sup> *Annual Book of ASTM Standards*, Vol 06.03.

<sup>6</sup> *Annual Book of ASTM Standards*, Vol 15.05.

TABLE 1 Pigment Composition Requirements

	Ideal	Typical	Range	Max
Aluminum oxide, Al <sub>2</sub> O <sub>3</sub> , %	39.50	38.8	37 to 42 <sup>A</sup>	...
Silicon dioxide, SiO <sub>2</sub> , %	46.54	45.4	48 to 43 <sup>B</sup>	...
Iron oxide, Fe <sub>2</sub> O <sub>3</sub> , %	...	0.3	...	0.5
Titanium dioxide, TiO <sub>2</sub> , %	...	1.5	...	2.0
Calcium oxide, CaO, %	...	0.1	...	0.2
Sodium oxide, Na <sub>2</sub> O, %	...	0.1	...	0.3
Potassium oxide, K <sub>2</sub> O, %	...	0.1	...	2.0
Other oxides, %	...	trace	...	0.1
Free moisture (105°C), %	...	...	...	1.0
Loss on ignition (1000°C), %	13.96	13.8	...	15.0

<sup>A</sup> Permitting up to 5 % excess Al<sub>2</sub>O<sub>3</sub>, for example as allophane.

<sup>B</sup> Permitting up to 5 % excess SiO<sub>2</sub>, for example as quartz.

3.3 *Water-Soluble Matter*—The water-soluble matter shall be not more than 0.50 %.

3.4 *Wet-Sieve Residue*—The pigment shall contain no more than 0.5 % 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 *Color*—The color (brightness, reflectance) shall conform to the following requirements:

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

3.5.2 The color shall be not less than a guaranteed minimum expressed as percent reflectance of standard illuminant C at 457 nm compared to a freshly smoked standard magnesium oxide surface by means of an accepted integrating sphere reflectance spectrophotometer<sup>7</sup> or a monochromatic reflectance meter,<sup>7</sup> or

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

3.6 *Oil Absorption*—The oil absorption shall be equal, within agreed upon tolerances, to that of a reference standard agreed upon between the purchaser and the seller.

3.7 Aluminum silicate pigments may be furnished in several types or grades whose various properties are dependent in part

<sup>7</sup> The General Electric Reflectance Spectrophotometer and the General Electric Reflectance Meter, respectively, have been found satisfactory for this purpose.

on average size or particle size distribution about the average, or both. The particle size shall be equal within agreed upon tolerances to that of a reference standard agreed upon between the purchaser and the seller.

#### **4. Number of Tests**

4.1 Two samples shall be taken at random from different packages from each lot, batch, day's pack, or other unit of production in a 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 (4540 kg), 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 in equal quantities the samples from the same production unit 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 1208. Determine the pH in accordance with Test Method E 70 except to maintain sufficient agitation of the slurry such that all particles are in suspension at 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 Method D 281 or D 1483.

5.1.5 *Particle Size Distribution*—Method D 422.

5.1.6 *Chemical Analysis*—Test Method D 718.

#### **6. Keywords**

6.1 aluminum silicate (hydrous); clay; pigments

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