



Standard Specification for Zinc Oxide Pigments¹

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1. Scope

1.1 This specification covers the pigments commercially known as “zinc white” or zinc oxide. The pigments may be purchased in the dry form or as a paste in oil.

NOTE 1—Zinc oxides are used in many industries. For additional information, see Specification D 4295 and Test Methods D 4315 for descriptions of zinc oxide use in rubber compounding.

2. Referenced Documents

2.1 ASTM Standards:

- D 185 Test Methods for Coarse Particles in Pigments, Pastes, and Paints²
- D 280 Test Methods for Hygroscopic Moisture (and Other Matter Volatile Under the Test Conditions) in Pigments²
- D 281 Test Method for Oil Absorption of Pigments by Spatula Rub-Out³
- D 332 Test Method for Relative Tinting Strength of White Pigments by Visual Observation³
- D 1483 Test Method for Oil Absorption of Pigments by Gardner-Coleman Method³
- D 2745 Test Method for Relative Tinting Strength of White Pigments by Reflectance Measurements³
- D 3280 Test Methods for Analysis of White Zinc Pigments²
- D 4295 Classification for Rubber Compounding Materials—Zinc Oxide⁴
- D 4315 Test Methods for Rubber Compounding Material—Zinc Oxide⁴
- E 20 Practice for Particle Size Analysis of Particulate Substances in the Range of 0.2 to 75 μm by Optical Microscopy⁵

3. Significance and Use

3.1 Zinc oxide functions as both a chemical and a pigment. It is used in a variety of applications including rubber, paint, reprography, glass, chemicals, etc. In paint, it contributes to mildew protection, ultraviolet absorption, hiding power, and neutralization of acids formed upon oxidation of the paint film.

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² *Annual Book of ASTM Standards*, Vol 06.03.

³ *Annual Book of ASTM Standards*, Vol 06.01.

⁴ *Annual Book of ASTM Standards*, Vol 09.01.

⁵ Discontinued; See 1993 *Annual Book of ASTM Standards*, Vol 14.02.

4. Composition and Properties

4.1 *Dry Pigment, French Process*—In the manufacture of French process zinc oxide, metallic zinc is vaporized, either in a boiler or a refining column, and the resulting vapor is burned in a controlled manner in an orifice. The fine particles of zinc oxide are cooled enough to agglomerate and are collected by a system of fabric bags. French process oxide shall conform to the properties listed in Table 1.

4.2 *Dry Pigment, American Process*— In the manufacture of American process zinc oxide, zinc ore is reduced in the presence of a carbonaceous fuel. The resulting vapor is burned in a combustion chamber, and the fine particles of zinc oxide are cooled enough to agglomerate and are collected by a system of fabric bags. American process oxide shall conform to the properties listed in Table 1.

4.3 *Paste in Oil*—The paste shall be made by thoroughly grinding the specified pigment with linseed oil. As received it shall not be caked in the container and shall break up readily in oil to form a smooth paint of brushing consistency. The paste shall conform to the following requirements:

Pigment, %	80 to 86
Linseed oil, %	14 to 20
Moisture and other volatile matter, max, %	0.5
Coarse particles and skins (total residue retained on a No. 325 (45-μm) sieve), max, % of the dry pigment	1.5

4.4 In such physical properties as are specified by the purchaser, the pigment shall satisfactorily match a reference sample mutually agreed upon by the purchaser and the seller. The most frequently specified properties are oil absorption, tinting strength, and particle shape. Appropriate test methods are listed in Section 6. In the event that either an acicular type or a nodular (spherical) type of zinc oxide is desired, the particle shape shall be determined by examining or photographing microscopic mounts (1000× or more) of the sample and the mutually agreed upon standard that are to be prepared as specified in Practice E 20.

5. Sampling

5.1 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

TABLE 1 Composition

	French Process	American Process
Zinc oxide, min, %	99	98.5
Total sulfur, max, %	0.1	0.2
Moisture and other volatile matter, max, %	0.5	0.5
Total impurities, including moisture and other volatile matter, max, %	1.0	1.5
Coarse particles (total residue retained on a No. 325 (45- μ m) sieve), max, %	0.10	0.25

blending in equal quantities the samples from the same production unit to form a composite sample.

6. Test Methods

6.1 Tests shall be conducted in accordance with the appropriate ASTM test methods, where applicable. Test procedures not covered by ASTM test methods shall be mutually agreed upon by the purchaser and the seller.

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- 6.1.1 *Coarse Particles*—Test Methods D 185.
- 6.1.2 *Moisture in Pigments*—Test Methods D 280.
- 6.1.3 *Chemical Analysis of Dry Pigments*— Methods D 3280.
- 6.1.4 *Oil Absorption of Pigments by Gardner-Coleman Method*—Test Method D 1483.
- 6.1.5 *Oil Absorption of Pigments by Spatula Rub-Out*—Test Method D 281.
- 6.1.6 *Instrumental Tinting Strength of White Pigments*—Test Method D 2745.
- 6.1.7 *Tinting Strength of White Pigments*— Test Method D 332.

7. Keywords

7.1 American process; French process; mildew protection; ultraviolet absorption; zinc oxide; zinc white