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Standard Specification for Zinc Phosphate Pigments¹

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1. Scope

1.1 This specification covers three types of pigments commercially known as zinc phosphate each of which may or may not be available in specific grades delineated by particle size or oil absorption.

1.1.1 Type I—Zinc Phosphate, dihydrate predominant.

1.1.2 Type II—Zinc Phosphate, dihydrate tetrahydrate mixture.

1.1.3 Type III—Zinc Phosphate, tetrahydrate predominant.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

2. Referenced Documents

2.1 *ASTM Standards*:²

D153 Test Methods for Specific Gravity of Pigments

D185 Test Methods for Coarse Particles in Pigments

D280 Test Methods for Hygroscopic Moisture (and Other Matter Volatile Under the Test Conditions) in Pigments

D281 Test Method for Oil Absorption of Pigments by Spatula Rub-out

D1193 Specification for Reagent Water

D1208 Test Methods for Common Properties of Certain Pigments

D1210 Test Method for Fineness of Dispersion of Pigment-Vehicle Systems by Hegman-Type Gage

D2448 Test Method for Water-Soluble Salts in Pigments by Measuring the Specific Resistance of the Leachate of the Pigment

3. Significance and Use

3.1 Zinc phosphate functions as both a chemical and a pigment. As a pigment it is used in a variety of applications including that of corrosion inhibiting paints.

¹ This specification is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.31 on Pigment Specifications.

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² 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.

4. Composition and Properties

4.1 Zinc phosphate pigment is a white corrosion inhibiting pigment consisting either predominately of zinc phosphate dihydrate ($\text{Zn}_3(\text{PO}_4)_2 \cdot 2\text{H}_2\text{O}$) or a mixture of zinc phosphate dihydrate and zinc phosphate tetrahydrate ($\text{Zn}_3(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}$) or predominately of zinc phosphate tetrahydrate which is free from extenders, diluents, and other pigments.

4.2 Zinc phosphate shall be a chemically prepared pigment and shall be of such type and grade as to conform to the requirements prescribed in Table 1. They shall additionally be free of extenders, modifiers, diluents, alteration of stoichiometric chemical structure, co-reacted precipitates, and carbonaceous material.

4.3 The desired properties of the pigment, other than as herein indicated, shall be subject to mutual agreement between interested parties and shall be based upon a satisfactory match between any submitted sample and a previously agreed upon reference sample.

5. Classification

5.1 *Type I*—which consists predominately of zinc phosphate dihydrate ($\text{Zn}_3(\text{PO}_4)_2 \cdot 2\text{H}_2\text{O}$) and exhibits a differentiating loss on ignition of the dried pigment at 600°C between 8.5 and 10.0 weight %.

5.2 *Type II*—which consists essentially of a mixture of zinc phosphate dihydrate ($\text{Zn}_3(\text{PO}_4)_2 \cdot 2\text{H}_2\text{O}$) and Zinc Phosphate Tetrahydrate ($\text{Zn}_3(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}$) and exhibits a differentiating loss on ignition of the dried pigment at 600°C between 10.0 and 14.0 weight %.

5.3 *Type III*—which consists predominately of zinc phosphate tetrahydrate ($\text{Zn}_3(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}$) and exhibits a differentiating loss on ignition of the dried pigment at 600°C between 14.0 and 18.0 weight %.

6. Sampling

6.1 Two samples shall be taken at random from different packages from each lot, batch, days 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 ratio of two samples for each 5000 kg, except for those shipments of less than 5000 kg where two samples shall be taken. At the option of the interested party the

TABLE 1 Zinc Phosphate Pigment Properties

Property	TYPE I	TYPE II	TYPE III
ZnO, weight percent (on ignited sample)	62.6 - 65.1	62.6 - 65.1	62.6 - 65.1
P ₂ O ₅ , weight percent (on ignited sample)	34.9 - 37.4	34.9 - 37.4	34.9 - 37.4
Loss on ignition, weight percent (of dried pigment)	8.5 - 10.0	10.0 - 14.0	14.0 - 18.0
Mean Particle Size (microns)	GRADE		
	F M C	F M C	F M C
	< 2.5 2.5-5.0 > 5.0	same	same
Oil adsorption	> 30 30 - 15 < 15	same	same
Matter soluble in water, specific resistance, (min. ohm - cm)	6500	6500	6500
Moisture and other volatile matter (105 - 110°C)	0.5	0.5	0.5
Specific gravity, g/cm ³	3.0 - 3.5	3.0 - 3.5	3.0 - 3.5
Hegman grind	6 min	6 min	6 min
Coarse particle percent residue 325 M (45 µm)	0.5 max	0.5 max	0.5 max
pH, aqueous suspension	6 - 8	6 - 8	6 - 8

samples may be tested separately or as a composite sample formed by blending in equal quantities the samples from the same unit of production.

7. Test Methods

7.1 Tests shall be conducted in accordance with the following test methods. Test procedures not incorporated here and not covered by ASTM test methods shall be mutually agreed upon between the interested parties.

- 7.1.1 Specific Gravity—Test Methods **D153**, Method B.
- 7.1.2 Oil Absorption—Test Method **D281**.
- 7.1.3 Hegman Grind—Test Method **D1210**.

7.1.4 Coarse Particles—Test Methods **D185**.

7.1.5 pH—Test Methods **D1208**.

7.1.6 Specific Resistance—Test Method **D2448**.

7.1.7 Moisture—Test Methods **D280**.

7.1.8 Chemical Analysis—Incorporated in this specification as **Annex A1** and **Annex A2**.

7.1.9 Loss on Ignition—Incorporated in this specification as **Annex A3**.

8. Keywords

- 8.1 analytical; zinc; zinc phosphate

ANNEXES

(Mandatory Information)

A1. TEST METHOD FOR DETERMINATION OF ZINC CONTENT FOR ZINC PHOSPHATE TYPE PIGMENTS

A1.1 Scope

A1.1.1 This test method covers the determination of the zinc content for zinc phosphate monohydrate, dihydrate, tetrahydrate, or mixtures of these various crystal water content pigments.

A1.1.2 *This standard does not purport to address all the safety concerns, if any, associated with its use. It is the*

responsibility of whoever uses this standard to consult and establish the appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

A1.2 Reference Documents

- A1.2.1 *ASTM Standards: Test Method for Determination of Loss on Ignition for Zinc Phosphate Type Pigments*