



## Standard Guide for Determining Volatile and Nonvolatile Content of Pigments<sup>1</sup>

This standard is issued under the fixed designation D 4139; 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.

### 1. Scope

1.1 This guide is intended to aid in the selection of the proper ASTM test method for determining the volatile and nonvolatile content of pigments.

NOTE 1—Test methods for determining the composition of the volatile fraction are not covered by this guide.

1.2 The standards included are as follows:

Standard	Section	ASTM Designation
Inert or low hiding pigments	4.1	D 280
White pigments	4.2	D 280
Black pigments	4.3	D 280 D 1509
Aluminum and zinc pigments	4.4	D 280 D 480
Blue pigments	4.5	D 280 D 1135
Green pigments	4.6	D 280
Yellow, orange, brown pigments	4.7	D 280 D 3724
Red pigments	4.8	D 763 D 280
Miscellaneous	4.9	

### 2. Referenced Documents

#### 2.1 ASTM Standards:

- D 280 Test Methods for Hygroscopic Moisture (and Other Matter Volatile Under the Test Conditions) in Pigments<sup>2</sup>
- D 480 Test Methods for Sampling and Testing of Flaked Aluminum Powders and Pastes<sup>2</sup>
- D 763 Specification for Raw and Burnt Umber Pigments<sup>2</sup>
- D 1135 Test Methods for Chemical Analysis of Blue Pigments<sup>2</sup>
- D 1509 Test Method for Carbon Black—Heating Loss<sup>3</sup>
- D 3724 Specification for Synthetic Brown Iron Oxide Pigment<sup>2</sup>

### 3. Significance and Use

3.1 The nonvolatile content of raw materials may be used to determine the total nonvolatile content (solids) of paint and related coatings. Such information may be useful to coatings producers and users for the determination of the total solids

available for film formation and for the estimation of the volatile organic content.

### 4. Procedure

#### 4.1 Inert or Low Hiding Pigments:

4.1.1 Test Methods D 280 contain Method A for pigments that do not decompose at 110°C and uses a time of 2 h at 105 to 110°C. Method B is for pigments that decompose at 110°C and use a vacuum to remove the volatile material.

4.1.1.1 Test Methods D 280 are applicable to anhydrous and hydrous aluminum silicate, calcium carbonate, magnesium silicate, pumice, and wet ground mica pigments for determination of hygroscopic moisture and other matter volatile under the test conditions.

4.2 *White Pigments*—Test Methods D 280 are applicable to titanium dioxide and zinc sulfide pigments.

#### 4.3 Black Pigments:

4.3.1 Test Methods D 280 are applicable to synthetic black iron oxide pigment.

4.3.2 Test Method D 1509 is used to determine heating loss in carbon black pigment.

#### 4.4 Aluminum and Zinc Pigments:

4.4.1 Test Methods D 480 cover the determination of nonvolatile matter in aluminum paste.

4.4.2 Test Methods D 280 are applicable to zinc dust (metallic zinc powder).

#### 4.5 Blue Pigments:

4.5.1 Test Methods D 280 are applicable to copper phthalocyanine blue and ultramarine blue pigments.

4.5.2 Test Methods D 1135 cover the determination of moisture in iron blue pigments by the Brabender moisture tester and by toluene distillation.

4.6 *Green Pigments*—Test Methods D 280 are applicable to pure chrome green, chrome oxide green, and phthalocyanine green pigments.

#### 4.7 Yellow, Orange, Brown Pigments:

4.7.1 Test Methods D 280 are applicable to zinc yellow (zinc chromate), chrome yellow, chrome orange, cuprous oxide, natural red and brown iron oxide, molybdate orange, ochre, raw and burnt sienna, and raw and burnt umber pigments.

4.7.2 Specification D 3724 specifies methods for the determination of moisture and other volatile matter in synthetic brown iron oxide pigment, requiring use of Test Methods D 280, Method A for pigments containing less than 8 % iron

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 06.03.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 09.01.

and Method B for pigments containing more than 8 % iron.

4.7.3 Specification D 763 specifies 105°C for determination of moisture and other volatile matter in raw and burnt umber. Additional loss at temperatures above 110°C is considered to be ignition loss.

4.8 *Red Pigments*—Test Methods D 280 are applicable to natural red and brown iron oxide, synthetic red iron oxide, pure para red toner, red lead, and pure toluidine red toner pigments.

4.9 *Miscellaneous*—No recommended methods are available for pigments not specifically listed in 4.1 through 4.8. Procedures to be used for determination of volatile and

nonvolatile content of pigments not specified in 4.1-4.8 should be agreed upon between the producer and user.

## 5. Precision

5.1 None of the references standards contain precision statements.

## 6. Keywords

6.1 nonvolatile content of pigments; volatile content of pigments

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