Designation: D4139 – 04 (Reapproved 2020)

Standard Guide for Determining Volatile and Nonvolatile Content of Pigments[1]

This standard is issued under the fixed designation D4139; 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	D280
White pigments	4.2	D280
Black pigments	4.3	D280
		D1509
Aluminum and zinc pigments	4.4	D280
		D480
Blue pigments	4.5	D280
		D1135
Green pigments	4.6	D280
Yellow, orange, brown pigments	4.7	D280
		D3724
Red pigments	4.8	D280
Miscellaneous	4.9	

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

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

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

D480 Test Methods for Sampling and Testing of Flaked Aluminum Powders and Pastes

D1135 Test Methods for Chemical Analysis of Blue Pigments

D1509 Test Methods for Carbon Black—Heating Loss

D3724 Specification for Synthetic Brown Iron Oxide Pigment

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 D280 contain Method A for pigments that do not decompose at 110°C, using a time of 2 h at 105 to 110°C, and Method B for pigments that decompose at 110°C, using vacuum to remove the volatile material.

4.1.1.1 Test Methods D280 are applicable to anhydrous and hydrous aluminum silicate, barium sulfate, calcium, borosilicate, calcium carbonate, diatomaceous silica, 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 D280 are applicable to titanium dioxide, white lead, and zinc sulfide pigments.

4.3 *Black Pigments:*

4.3.1 Test Methods D280 are applicable to synthetic black iron oxide pigment.

4.3.2 Test Methods D1509 is used to determine heating loss in carbon black pigment.

4.4 *Aluminum and Zinc Pigments:*

4.4.1 Test Methods D480 include the determination of nonvolatile matter in aluminum paste.

4.4.2 Test Methods D280 are applicable to zinc dust (metallic zinc powder).

4.5 *Blue Pigments:*

4.5.1 Test Methods D280 are applicable to copper phthalocyanine blue and ultramarine blue pigments.

[1] This guide 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.

4.5.2 Test Methods D1135 include the determination of moisture in iron blue pigments by the Brabender moisture tester and by toluene distillation.

4.6 *Green Pigments*—Test Methods D280 are applicable to pure chrome green, chrome oxide green, and phthalocyanine green pigments.

4.7 *Yellow, Orange, Brown Pigments:*

4.7.1 Test Methods D280 are applicable to zinc yellow (zinc chromate), strontium chromate, chrome yellow, chrome orange, cuprous oxide, natural red and brown iron oxide, molybdate orange, ocher, raw and burnt sienna, and raw and burnt umber pigments.

4.7.2 Specification D3724 specifies methods for the determination of moisture and other volatile matter in synthetic brown iron oxide pigment, requiring use of Test Methods D280, Method A for pigments containing less than 8 % ferrous iron oxide and Method B for pigments containing more than 8 % ferrous iron oxide.

4.8 *Red Pigments*—Test Methods D280 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. Keywords

5.1 nonvolatile content of pigments; volatile content of pigments