Designation: D 564 – 87 (Reapproved 2002)

Standard Test Methods for Liquid Paint Driers[1]

This standard is issued under the fixed designation D 564; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 These test methods cover the test procedures to be applied to liquid paint driers used in paints and related coatings. Typical paint driers, listed in Specification D 600, are carboxylates of lead, cobalt, manganese, zinc, iron, calcium, and zirconium.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 234 Specification for Raw Linseed Oil[2]

D 235 Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)[3]

D 600 Specification for Liquid Paint Driers[3]

D 1544 Test Method for Color of Transparent Liquids (Gardner Color Scale)[4]

D 1640 Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature[4]

D 1644 Test Methods for Nonvolatile Content of Varnishes[4]

D 2090 Test Method for Clarity and Cleanness of Paint and Ink Liquids[2]

D 2373 Test Method for Determination of Cobalt in Paint Driers by EDTA Method[4]

D 2374 Test Method for Lead in Paint Driers by EDTA Method[4]

D 2375 Test Method for Manganese in Paint Driers by EDTA Method[4]

D 2613 Test Method for Calcium or Zinc in Paint Driers by EDTA Method[4]

D 3804 Test Method for Iron in Paint Driers by EDTA Method[4]

D 3924 Specification for Standard Environment for Conditioning and Testing Paint, Varnish, Lacquer, and Related Materials[4]

D 3969 Test Method for Zirconium in Paint Driers by EDTA Method[4]

D 3970 Test Method for Cerium in Paint Driers by Oxidimetric Determination[4]

D 3980 Practice for Interlaboratory Testing of Paint and Related Materials[4]

D 3988 Test Method for Vanadium in Paint Driers by EDTA Method[4]

D 3989 Test Method for Total Rare Earth Metals in Paint Driers by EDTA Method[4]

3. Significance and Use

3.1 Driers accelerate the drying of oil, paint, printing ink, and varnish.

3.2 These test methods are applicable to liquid driers manufactured for use in paints and related coatings.

3.3 The tests for metallic content using ethylenediaminetetraacetic acid dihydrate (EDTA) are intended for concentrated solutions of single metals; two or more metals may cause interference.

4. Physical Tests

4.1 *Sampling*—Sample in accordance with Practice D 3980.

4.2 *Conditioning*—Follow Specification D 3924 except where other temperatures are specified.

4.3 *Appearance*—After conditioning overnight at room temperature (see Specification D 3924) examine the drier without aid of magnification for clarity and cleanness and for presence of foreign matter, sediment, skins, turbidity or haziness, in accordance with Test Method D 2090.

4.4 *Sediment or Suspended Matter*—If sediment or suspended matter is observed, proceed as follows:

4.4.1 Weigh to 1 mg, by difference, 1 to 5 g of drier into a tared 10 to 15-μm fritted-glass crucible. After most of the drier has passed through wash with mineral spirits conforming to Specification D 235 and dry at 50°C until the weight is constant to 1 mg. Calculate the difference in weight and report as percent sediment in the drier.

4.5 *Color*—Determine color in accordance with Test Method D 1544.

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[1] These test methods are under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and are the direct responsibility of Subcommittee D01.21 on Chemical Analysis of Paints and Paint Materials.

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

[3] *Annual Book of ASTM Standards,* Vol 06.04.

[4] *Annual Book of ASTM Standards,* Vol 06.01.

NOTE 1—This scale is useful for yellow and brown organic chromophores, but not with the reds or purple of cobalt and certain other metal compounds.

4.6 *Nonvolatile Matter*—Determine the nonvolatile content in accordance with Test Methods D 1644 using either Method A or B as mutually agreed upon between the supplier and the user.

4.7 *Miscibility with Oil*—Mix 1 volume of the sample with 19 volumes of raw linseed oil under room temperature conditions. Record any signs of separation or clouding. Observe the mixture at 1-h intervals for 3 h and again after 24 h. For the reference use the raw linseed oil kept in a container similar to the one with the test specimens.

NOTE 2—In case of disagreement between the supplier and the user, make the test for miscibility with oil at 25 ± 1°C.

NOTE 3—The linseed oil specified in Specification D 234 may vary in clarity from one commercial source or linseed crop year to another and in content of small amounts of moisture. Aging from one to six months in a closed container at 23°C or (or even 10°C) and then decanting supernatant oil from sediment may yield a more uniform linseed oil for miscibility testing.

4.8 *Stability*—Each drier shall show no clotting or gelation or evidence of precipitation after standing for 7 days at 25°C, − 20°C, 50°C. If there is evidence of clotting, gelation, or precipitation after 7 days at − 20°C or 50°C, the drier is still considered satisfactory if all signs of clotting, gelation, or precipitation disappear after it is permitted to stand overnight at room temperature.

4.9 *Drying Power*—Determine the drying power in accordance with Test Methods D 1640. It is useful to test a previously evaluated standard of known drying power for comparative purposes.

NOTE 4—The drying powers or efficiencies of individual metal driers may be a function of: (1) the class of carboxylic acids, for example, octoate versus naphthenate, etc., (2) additives in drier solutions, for example, stabilizers, etc., (3) chemical unsaturation of the drying oil, (4) other metals used in conjunction with the subject drier, and (5) the other components (for example, pigments, etc.) in the formulated paint.

5. Chemical Analysis

5.1 *Cobalt*—Determine in accordance with Test Method D 2373.

5.2 *Lead*—Determine in accordance with Test Method D 2374.

5.3 *Manganese*—Determine in accordance with Test Method D 2375.

5.4 *Calcium*—Determine in accordance with Test Method D 2613.

5.5 *Zinc*—Determine in accordance with Test Method D 2613.

5.6 *Iron*—Determine in accordance with Test Method D 3804.

5.7 *Zirconium*—Determine in accordance with Test Method D 3969.

5.8 *Cerium*—Determine in accordance with Test Method D 3970.

5.9 *Vanadium*—Determine in accordance with Test Method D 3988.

5.10 *Rare Earth*—Determine in accordance with Test Method D 3989.

6. Keywords

6.1 driers; standard tests; liquid paint driers

APPENDIX

(Nonmandatory Information)

X1. HISTORICAL INFORMATION

X1.1 Historic methods for testing lead, cobalt, calcium, zinc, manganese, and iron can be found in the 1979 *Annual Book of ASTM Standards,* Part 29, Method D 564.

X1.1.1 These methods were of primary interest before the introduction (about 1930) of commercial naphthenate driers that enabled higher concentrations of drier metals in solution, than in much earlier practice when the oxides and salts of lead, manganese, and cobalt were saponified while heating with linseed oil, resin, and other naturally occurring organic acids or esters. Metal concentrations were then as low as 10 % lead, 1 % manganese, or 0.5 % cobalt.

X1.2 Methods for testing cerium (Test Method D 3970), rare earth metals (Test Method D 3989), zirconium (Test Method D 3969), and vanadium (Test Method D 3988) are being developed. Each is suitable for the determination of the metal content of the drier which does not contain other drier elements. Each method is not applicable to drier blends.

X1.3 An atomic absorption method is being developed that will be suitable for singular driers as well as drier blends.