



Designation: D 2071 – 87 (Reapproved 1998)

## Standard Test Methods for Fatty Nitrogen Products<sup>1</sup>

This standard is issued under the fixed designation D 2071; 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.

*These test methods were prepared jointly by ASTM and the American Oil Chemists' Society.*

### 1. Scope

1.1 These test methods cover the testing of fatty nitrogen products. They specify the use of other ASTM methods that are published separately. The test methods included are listed in Table 1.

1.2 The test methods cover the following compounds:

1.2.1 *Fatty Amines*—Fatty primary amines, difatty secondary amines, trifatty tertiary amines.

1.2.2 *Fatty Quaternary Ammonium Chloride*—Trimethyl fatty quaternary ammonium chloride, dimethyl difatty quaternary ammonium chloride.

1.2.3 *Fatty Amidoamines*—Reaction products of fatty acids with an excess of polyamines.

1.2.4 *Fatty Diamines*—N-fatty-1,3-propylene diamines.

1.3 *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 56 Test Method for Flash Point by Tag Closed Tester<sup>2</sup>

D 88 Test Method for Saybolt Viscosity<sup>3</sup>

D 92 Test Method for Flash and Fire Points by Cleveland Open Cup<sup>2</sup>

D 93 Test Methods for Flash Point by Pensky-Martens Closed Tester<sup>2</sup>

D 1209 Test Method for Color of Clear Liquids (Platinum-Cobalt Scale)<sup>4</sup>

D 1310 Test Method for Flash Point and Fire Points of Liquids by Tag Open-Cup Apparatus<sup>5</sup>

D 1466 Test Method for Sampling Liquid Oils and Fatty

TABLE 1 List of Test Methods

| Test Method                          | Sections | ASTM Designation of Test Method |
|--------------------------------------|----------|---------------------------------|
| Definition                           | 4        |                                 |
| All Fatty Nitrogen Products:         |          |                                 |
| Sampling                             | 5        | D 1466                          |
| Color by the Gardner Method          | 6        | D 1544                          |
| Color by the APHA Method             | 7        | D 1209                          |
| Water by the Karl Fischer Method     | 8        | D 2072                          |
| Fatty Amines:                        |          |                                 |
| Amine values                         | 9        | D 2073                          |
| Iodine value                         | 10       | D 2074                          |
| Percent non-amine                    | 11       | D 2075                          |
| Primary, secondary, tertiary amines  | 12       | D 2082                          |
| Fatty Quaternary Ammonium Chlorides: |          |                                 |
| Acid value and amine value           | 13       | D 2083                          |
| Ash                                  | 14       | D 2076                          |
| Flash point                          | 15       | D 2077                          |
|                                      |          | D 56                            |
|                                      |          | D 88                            |
|                                      |          | D 92                            |
|                                      |          | D 93                            |
|                                      |          | D 1310                          |
|                                      |          | D 3278                          |
| Iodine value                         | 16       | D 2078                          |
| Nonvolatile matter                   | 17       | D 2079                          |
| Average molecular weight             | 18       | D 2080                          |
| pH                                   | 19       | D 2081                          |
| Fatty Amidoamines:                   |          |                                 |
| Amine values                         | 20       | D 2073                          |
| Iodine value                         | 21       | D 2075                          |
| Fatty Diamines:                      |          |                                 |
| Amine values                         | 22       | D 2073                          |
| Iodine values                        | 23       | D 2075                          |
| Percent non-amines                   | 24       | D 2082                          |

Acids Commonly Used in Paints, Varnishes, and Related Materials<sup>6</sup>

D 1544 Test Method for Color of Transparent Liquids (Gardner Color Scale)<sup>5</sup>

D 2072 Test Method for Water in Fatty Nitrogen Compounds<sup>6</sup>

D 2073 Test Methods for Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines, Amidoamines, and Diamines by Referee Potentiometric Method<sup>6</sup>

D 2074 Test Methods for Total, Primary, Secondary, and

<sup>1</sup> These test methods are under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings, Materials, and Applications, and are the direct responsibility of Subcommittee D01.32 on Drying Oils.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 05.01.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 04.04.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 06.04.

<sup>5</sup> *Annual Book of ASTM Standards*, Vol 06.01.

<sup>6</sup> *Annual Book of ASTM Standards*, Vol 06.03.

Tertiary Amine Values of Fatty Amines by Alternative Indicator Method<sup>6</sup>

D 2075 Test Method for Iodine Value of Fatty Amines, Amidoamines, and Diamines<sup>6</sup>

D 2076 Test Methods for Acid Value and Amine Value of Fatty Quaternary Ammonium Chlorides<sup>6</sup>

D 2077 Test Method for Ash in Fatty Quaternary Ammonium Chlorides<sup>6</sup>

D 2078 Test Method for Iodine Value of Fatty Quaternary Ammonium Chlorides<sup>6</sup>

D 2079 Test Method for Nonvolatile Matter (Solids) in Fatty Quaternary Ammonium Chlorides<sup>6</sup>

D 2080 Test Method for Average Molecular Weight of Fatty Quaternary Ammonium Chlorides<sup>6</sup>

D 2081 Test Method for pH of Fatty Quaternary Ammonium Chlorides<sup>6</sup>

D 2082 Test Method for Percent of Non-amines in Fatty Nitrogen Compounds<sup>6</sup>

D 2083 Test Method for Calculation of Percent of Primary, Secondary, and Tertiary Amines in Fatty Amines<sup>6</sup>

D 3278 Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus<sup>5</sup>

### 3. Terminology

#### 3.1 Definition:

3.1.1 *fatty nitrogen products*—nitrogen containing compounds derived from vegetable and animal fatty acids.

3.1.1.1 *Discussion*—Vegetable and animal fatty acids include coconut, cotton, soya, tallow and tall oil fatty acids, fatty acid fractions thereof, and hydrogenated fatty acids.

### 4. Significance and Use

4.1 These test methods list the methods used to test fatty amines, fatty quaternary ammonium chlorides, fatty amidoamines and fatty diamines. The results of the tests can be used to determine the purity of these materials and therefore can be used for establishing specifications.

## ALL FATTY NITROGEN PRODUCTS

### 5. Sampling

5.1 The techniques outlined in Test Method D 1466, should be generally suitable with the following additions:

5.1.1 Fatty amines and diamines can sensitize and irritate. Wash from clothing and body surfaces immediately on contact. Protect from air to prevent absorption of carbon dioxide and formation of carbonates. Prolonged storage at elevated temperatures will discolor and degrade.

5.1.2 Fatty quaternary ammonium chlorides usually contain volatile alcohols. Avoid losing these components during sampling and analysis. Prolonged storage at elevated temperatures will discolor and degrade.

### 6. Color by the Gardner Method

6.1 Gardner color is determined by matching a standard color in an empirical series graduated from 1 (pale yellow) to 18 (dark brown).

6.2 Determine color in accordance with Test Method D 1544, but report the color as 3–, 3, 3+, 4–, and so on. When the color is Gardner 2+ or less, determine the platinum-cobalt color also.

6.3 The precision of the method in the range of values of 1 to 18 is as follows:

6.3.1 *Repeatability*—Two single determinations performed in one laboratory should be considered suspect if they differ by more than 0.6 unit.

6.3.2 *Reproducibility*—Single determinations performed in two different laboratories should be considered suspect if they differ by more than 1.4 units.

### 7. Color on the Platinum-Cobalt Scale

7.1 Color on the platinum-cobalt scale (sometimes referred to as platinum-cobalt or Hazen Color) is determined by matching a standard color in an empirical series graduated from 0 (colorless) to 500 (pale yellows).

7.2 Determine color in accordance with Test Method D 1209, but report one of the following values: 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 150, 200, 300, 350, 400, 450, 500, DT 500.

7.3 The precision of this test method has not yet been determined for fatty nitrogen products.

### 8. Water by the Karl Fischer Method

8.1 Water is determined by reacting with an excess of Karl Fischer reagent, which is then back-titrated with water-methanol solution. The usual direct titration with Karl Fischer reagent results in high values for these products.

8.2 Determine the percent of water in accordance with Test Method D 2072.

## FATTY AMINES

### 9. Amine Values

9.1 Total, primary, secondary, and tertiary amine values are defined as the milligrams of potassium hydroxide equivalent to the total, primary, secondary, and tertiary amine basicities in 1 g of sample. These empirical values may be converted to percent total, percent primary, percent secondary, and percent tertiary amines, if the average molecular weights of these components in the sample are known.

#### 9.2 Procedure:

9.2.1 Determine the amine values in accordance with Test Methods D 2073.

9.2.2 Alternatively, determine the amine values in accordance with Test Methods D 2074.

### 10. Iodine Value

10.1 The iodine value is a measure of the unsaturation of the alkyl groups, defined as the percent by weight equivalent of iodine absorbed per gram of sample.

10.2 Determine the iodine value in accordance with Test Method D 2075. This test method is a modified Wijs method using acetic acid as the solvent and mercuric acetate as catalyst.