



Standard Classification for Rubber Compounding Materials—Stearic Acid¹

This standard is issued under the fixed designation D 4817; 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 classification covers the compounding materials commercially known as stearic acid.

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 1466 Test Method for Sampling Liquid Oils and Fatty Acids Commonly Used in Paints, Varnishes, and Related Materials²
- D 1951 Test Method for Ash in Drying Oils and Fatty Acids²
- D 1959 Test Method for Iodine Value of Drying Oils and Fatty Acids²
- D 1962 Test Method for Saponification Value of Drying Oils, Fatty Acids, and Polymerized Fatty Acids²
- D 1965 Test Method for Unsaponifiable Matter in Drying Oils, Fatty Acids, and Polymerized Fatty Acids²
- D 1980 Test Method for Acid Value of Fatty Acids and Polymerized Fatty Acids²
- D 1982 Test Method for Titer of Fatty Acids²
- D 1983 Test Method for Fatty Acid Composition by Gas-Liquid Chromatography of Methyl Esters²
- D 4075 Test Methods for Compounding Materials—Flame Atomic Absorption Technique—Determination of Metals³

3. Significance and Use

3.1 Stearic acid is important in the rubber vulcanization process. It is believed that the stearic acid reacts with zinc-oxide or other metallic oxides, during vulcanization, to form a rubber soluble salt or soap, that reacts with the accelerator enabling it to exert its full effect.

3.2 Stearic acid of commerce is generally a mixture of palmitic, stearic and oleic acids usually derived from tallow base stock but can be derived from other fats and oils of animal or vegetable origins.

4. Basis of Classification

4.1 Classification of Stearic Acid by Classes:

4.1.1 There are several different classes of stearic acid, based on stearic acid content and iodine value. There are two classes predominantly used in rubber compounding.

4.1.1.1 *Class Number 1: Stearic Acid Containing Unsaturated Fatty Acids*—Stearic acid containing unsaturated acids is commonly referred to as rubber grade stearic acid. Three grades are commonly available with low, medium, and high unsaturation. These grades of stearic acid are used in rubber compounding where unsaturated fatty acids can be tolerated. (See Table 1 for typical analysis of Class 1 stearic acid.)

TABLE 1 Typical Physical and Chemical Properties of Stearic Acid—Class Number 1^A

Property	Test Method	Grade 1 Low-IV ^B	Grade 2 Med-IV ^B	Grade High-IV ^B
Ash, %	D 1951	0.2 max	0.2 max	0.2 max
Iodine value, g/100 g	D 1959	8 max	15 max	39 ± 5
Saponification value, mg KOH/g	D 1962	204.5 ± 5.0	204.5 ± 5.0	...
Unsaponification matter, %	D 1965	3.0 max	3.0 max	...
Acid value, mg KOH/g	D 1980	203.5 ± 4.5	203.0 ± 4.5	203.5 ± 4.5
Titer, °C	D 1982	56.0 ± 4.5	53.0 ± 3.0	48.5 ± 4.5
Trace metals, ppm	D 4075	varies from industry to industry		

^AThe values listed in Table 1 are typical ranges and values.

^BIV = iodine value.

^CTrace metals such as nickel, iron, copper, and manganese can be determined in accordance with Test Method D 4075.

4.1.1.2 Class Number 2—Stearic Acid with Low Levels of Unsaturated Fatty Acids—Low IV:

(1) Low iodine value stearic acid is produced in several grades. Two grades are commonly used in rubber compounding where a 1.0 maximum iodine value is needed. These two grades are distinguished by their ratios of palmitic to stearic acid content. The physical and chemical properties of the stearic acid will change as the palmitic/stearic acid ratio

¹ This classification is under the jurisdiction of ASTM Committee D-11 on Rubber and is the direct responsibility of Subcommittee D11.20 on Compounding Materials and Procedures.

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² Annual Book of ASTM Standards, Vol 06.03.

³ Annual Book of ASTM Standards, Vol 09.01.