



Standard Classification for Petroleum Waxes for Use in Rubber Compounding¹

This standard is issued under the fixed designation D 4924; 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 standard is intended to establish a classification system and test methods for petroleum waxes used in rubber compounding primarily as a static protective agent or material for unsaturated rubbers such as styrene-butadiene rubber, polyisoprene rubber, natural rubber, chloroprene rubber, acrylonitrile-butadiene rubber, and polybutadiene rubber. These unsaturated rubbers are subject to ozone cracking. Under certain exposure conditions, waxes retard this cracking.

1.2 This classification is applicable to petroleum waxes used as process aids in rubber compounding. It is not applicable to nonpetroleum waxes such as caruba wax, candelille wax, or ceresin wax, nor to synthetic hydrocarbon waxes such as polyethylene wax. These non-petroleum waxes display a different behavior on gas chromatographic analysis than do petroleum waxes.

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 87 Test Method for Melting Point of Petroleum Wax (Cooling Curve)²
- D 445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)²
- D 721 Test Method for Oil Content of Petroleum Waxes²
- D 938 Test Method for Congealing Point of Petroleum Waxes, Including Petrolatum²
- D 1321 Test Method for Needle Penetration of Petroleum Waxes²
- D 1500 Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)²
- D 1747 Test Method for Refractive Index of Viscous Materials²
- D 1833 Test Method for Odor of Petroleum Wax²
- D 2887 Test Method for Boiling Range Distribution of

Petroleum Fractions by Gas Chromatography³

D 3944 Test Method for Solidification Point of Petroleum Wax³

D 4419 Test Method for Measurement of Transition Temperatures of Petroleum Waxes by Differential Scanning Calorimetry³

2.2 ASTM Committee Proposal:

D-2 Proposal P167 Test Method for Boiling Range Distribution of Crude Petroleum⁴

NOTE 1—A procedure using similar gas chromatographic methodology but designed specifically for waxes is currently being developed by ASTM Committee D02.04.C.

3. Summary of Classification

3.1 The boiling point range of the petroleum wax is determined by simulated distillation by gas chromatography (Test Method D 2887). If necessary, an internal standard is used to determine the amount of material not volatile under the conditions of the chromatograph.

3.2 Classification is made on the basis of the amount of the sample with normal boiling point above 538°C (1000°F).

3.3 Further characterization is then done using other test methods on the wax. In particular, the melting point behavior, color, odor, and viscosity when melted and refractive index when melted have been found useful.

4. Significance and Use

4.1 Petroleum waxes in rubber compounds are commonly used to provide protection from degradation by ozone under static conditions, that is, when there is little or no flexing of the rubber products. The mode of action for this protection is (1) migration of the wax through the rubber to the surface of the product and (2) the formation of an ozone impervious film on the surface.

4.2 This standard classifies the petroleum waxes on the basis of molecular weight. In general, waxes of lower molecular weight (“paraffinic” or “crystalline”) migrate through the rubber more rapidly and form more brittle film than the higher molecular weight waxes (“microcrystalline”). Wax mixtures and blends are commonly used.

4.3 No direct inference of suitability for use in a particular rubber compound is made or implied by the classifications herein.

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 05.01.

³ Annual Book of ASTM Standards, Vol 05.02.

⁴ Discontinued—See 1985 Annual Book of ASTM Standards, Vol 05.03.