



Designation: **D4175—20a** D4175 – 20a^{ε1}

Standard Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants¹

This standard is issued under the fixed designation D4175; 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 U.S. Department of Defense.

^{ε1} NOTE—Terms were transferred and updated editorially in November 2020.

1. Scope*

1.1 This terminology standard covers the compilation of terminology developed by Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants, except that it does not include terms/definitions specific only to the standards in which they appear.

1.1.1 The terminology, mostly definitions, is unique to petroleum, petroleum products, lubricants, and certain products from biomass and chemical synthesis. Meanings of the same terms outside of applications to petroleum, petroleum products, and lubricants can be found in other compilations and in dictionaries of general usage.

1.1.2 The terms/definitions exist in two places: (1) in the standards in which they appear and (2) in this compilation.

1.2 *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. Terminology

2.1 Alphabetical listing of terms with definitions for each term showing attributions as to source and subcommittee jurisdiction is in bold print following the definition. Those showing no attributes are under the jurisdiction of Subcommittee CS 95. Acronyms, abbreviations, and symbols are listed separately in 2.2, following the defined terms.

1,3-butadiene—hydrocarbon product containing more than 99 % 1,3-butadiene. [D02.D0] D5274

abrasion, *n*—wear by displacement of material caused by hard particles or hard protuberances. [D02.96] D7684, D7690

abrasive wear, *n*—wear due to hard particles or hard protuberances forced against and moving along a solid surface. [D02.B0] D4998; [D02.L0] D5182

DISCUSSION—
Also called cutting wear in some instances such as machining swarf. [D02.96] D7898

absorbance, *n*—logarithm to the base 10 of the ratio of the reciprocal of the transmittance. [D02.03] D7740

¹ This terminology is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.95 on Terminology.

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*A Summary of Changes section appears at the end of this standard

absorbance, (A), *n*—the molecular property of a substance that determines its ability to take up radiant energy, expressed by:

$$A = \log_{10}(1/T) = -\log_{10}(T)$$

where *T* is the transmittance.

DISCUSSION—

Absorbance expresses the excess absorption over that of a specified reference or standard. It is implied that compensation has been affected for reflectance losses, solvent absorption losses, and refractive effects, if present, and that attenuation by scattering is small compared with attenuation by absorption. **[D02.14] D7996**

absorbance, *A, n*—the molecular property of a substance that determines its ability to take up radiant power, expressed by:

$$A = \log_{10} (1/T) = -\log_{10}T$$

where *T* is the transmittance.

DISCUSSION—

Absorbance expresses the excess absorption over that of a specified reference or standard. It is implied that compensation has been affected for reflectance losses, solvent absorption losses, and refractive effects, if present, and that attenuation by scattering is small compared with attenuation by absorption. **[D02.04] D2008**

absorptivity, *a, n*—the specific property of a substance to absorb radiant power per unit sample concentration and path length, expressed by:

$$a = A/fbc$$

where:

- A* = the absorbance,
- f* = the dilution factor,
- b* = sample cell path length, and
- c* = the quantity of absorbing substance contained in a volume of solvent.

[D02.04] D2008

acceptance limit (AL), *n*—a numerical value that defines the point between acceptable and unacceptable quality.

DISCUSSION—

The AL is not necessarily the specification limit. It is a value that takes into account the specification limit, the test method precision, and the desired probability of product acceptance if the quality is at the specification limit. **[D02.94] D3244**

accepted reference value (ARV), *n*—value that serves as an agreed-upon reference for comparison and that is derived as (1) a theoretical or established value, based on scientific principles, (2) an assigned value, based on experimental work of some national or international organization, such as the U.S. National Institute of Standards and Technology (NIST), or (3) a consensus value, based on collaborative experimental work under the auspices of a scientific or engineering group. **[D02.04] D6596; [D02.25] D8340**

DISCUSSION—

In the context of this test method, accepted reference value is understood to apply to the ignition delay of specific reference materials determined under reproducibility conditions by collaborative experimental work. **[D02.01] D6890**

DISCUSSION—

In the context of this method, accepted reference value is understood to apply to the ignition delay of specific reference materials determined under reproducibility conditions by collaborative experimental work. **[D02.01] D7170**

DISCUSSION—

In the context of this test method, accepted reference value is understood to apply to the Motor octane number of specific reference materials determined empirically under reproducibility conditions by the National Exchange Group or another recognized exchange testing organization. **[D02.01] D2700**

DISCUSSION—

In the context of this test method, accepted reference value is understood to apply to the Research octane number of specific reference materials determined empirically under reproducibility conditions by the National Exchange Group or another recognized exchange testing organization. **[D02.01] D2699**

DISCUSSION—

In the context of this test method, accepted reference value is understood to apply to the supercharge and octane number ratings of specific reference materials determined empirically under reproducibility conditions by the National Exchange Group or another recognized exchange testing organization. **[D02.01] D909**

DISCUSSION—

In the context of this test method, accepted reference value is understood to apply to standard fuel or check fuel average research or motor octane numbers determined under reproducibility conditions by a recognized exchange testing organization having a minimum of 16 participants. **[D02.01] D2885**

DISCUSSION—

In the context of this method, accepted reference value is understood to apply to the ignition delay and the combustion delay of specific reference materials determined under reproducibility conditions by collaborative experimental work. **[D02.01] D7668**

accommodation cracks, *n*—(also referred to as Mrozowski-like cracks) cracks and voids formed between basal planes and at domain interfaces throughout the graphite microstructure from thermal contraction of the graphite during carbonization/graphitization (sometimes referred to as calcination cracks), from chemical decomposition of the liquid crystal hydrocarbon precursor in graphite manufacture (also referred to as calcination cracks) and following cooling after graphitization (manufacture). In irradiated graphite, they also comprise cracks arising from anisotropic responses to irradiation. **[D02.F0] D8075**

acid number, *n*—the quantity of a specified base, expressed in milligrams of potassium hydroxide per gram of sample, required to titrate a sample in a specified solvent to a specified endpoint using a specified detection system. **[D02.06] D8045; [D02.09] D943**

DISCUSSION—

In this test method, acids or salts with dissociation constants greater than 10^{-9} , are titrated to a green end point with *p*-naphtholbenzein indicator. **[D02.06] D3339**

DISCUSSION—

In this test method, the acid number is calculated from the number of drops required to produce a change in solution color from blue-green to orange, compared to the number of drops required to produce an identical color change using a reference standard. Because this is a direct comparison method, the acid number value can be reported in milligrams of potassium hydroxide per gram of sample. **[D02.06] D5770**

DISCUSSION—

In this test method, the indicator is *p*-naphtholbenzein titrated to a green/green-brown end point in a toluene-water-isopropanol solvent. **[D02.06] D974**

DISCUSSION—

In this test method, the solvent is a toluene-water-isopropanol mixture and the end point is determined when a green/green brown color is obtained using the specified *p*-naphtholbenzein indicator solution. **[D02.06] D3242**

DISCUSSION—

This test method expresses the quantity of base as milligrams of potassium hydroxide per gram of sample, that is required to titrate a sample in a mixture of toluene and propan-2-ol to which a small amount of water has been added from its initial meter reading in millivolts to a meter reading in millivolts corresponding to an aqueous basic buffer solution or a well-defined inflection point as specified in the test method. **[D02.06] D664**

DISCUSSION—

This test method provides additional information. The quantity of base, expressed as milligrams of potassium hydroxide per gram of sample, required to titrate a sample in the solvent from its initial meter reading in millivolts to a meter reading in millivolts corresponding to a freshly prepared aqueous acidic buffer solution or a well-defined inflection point as specified in the test method shall be reported as the *strong acid number*. **[D02.06] D664**

DISCUSSION—

The causes and effects of the so-called strong acids and the causes and effects of the other acids can be very significantly different. Therefore, the user of this test method shall differentiate and report the two, when they are found. **[D02.06] D664**

acidity, *n*—the quality, state or degree of being acid.

DISCUSSION—

In this test method, the criterion for acidity is a pink or red color when methyl orange indicator is used. **[D02.06] D1093**

DISCUSSION—

The amount of acid titrated with a base (NaOH or KOH) in a sample of ethanol or ethanol blend with gasoline, calculated as acetic acid in mg/kg (ppm mass). **[D02.06] D7795**

activated sludge, *n*—the precipitated solid matter, consisting mainly of bacteria and other aquatic microorganisms, that is

produced at a domestic wastewater treatment plant and is used primarily in secondary sewage treatment to microbially oxidize dissolved organic matter in the effluent.

[D02.12] D6731

activated sludge, *n*—the precipitated solid matter, consisting mainly of bacteria and other aquatic microorganisms, that is produced in a domestic wastewater treatment plant; activated sludge is used primarily in secondary sewage treatment to microbially oxidized dissolved organic matter in the effluent.

[D02.12] D6139

activation energy (E_a)—measure of temperature effects on the rate of oxidation in the kinetic, or chemical control, regime. Activation energy is calculated from the Arrhenius equation:

$$OR = Z \exp(-E_a/RT)$$

where:

OR = oxidation rate,
 R = 8.314 J mole⁻¹ K⁻¹ is the universal gas constant,
 T = absolute temperature (in Kelvin), and
 Z = pre-exponential factor.

The activation energy and pre-exponential factor are calculated from linearized form of Arrhenius equation, that is, from the slope and intercept of the linear plot of the logarithm of oxidation rate versus the inverse of absolute temperature ($1/T$):

$$\log_{10}(OR) = \log_{10} Z - E_a/(2.303 RT)$$

Activation energy is expressed in units of kJ/mol. Pre-exponential factor is expressed in the same units as the oxidation rates, namely g h⁻¹ m⁻² (for Z_a calculated from area-normalized oxidation rates, OR_a) or g g⁻¹ h⁻¹ (for Z_w calculated from weight-normalized oxidation rates, OR_w).

[D02.F0] D7542

active grease-sampling device, *n*—device designed to take an active sample of a lubricating grease from a bearing, gear, or drive shaft located in a grease-lubricated component.

[D02.G0] D7718

active sampling, *v*—to use a sampling device to actively gather an in-service lubricating grease sample from a grease-lubricated component.

[D02.G0] D7718

actuate, *v*—to hold the interior cylinder of the active grease-sampling device while pushing the exterior cylinder forward toward the grease-lubricated component that is being sampled allowing lubricating grease to fill the sampling device.

[D02.G0] D7718

acute ecotoxicity, *n*—the propensity of a material to produce adverse behavioral, biochemical, or physiological effects in non-human organisms or populations in a short period of time, usually not constituting a substantial portion of the life span of the organism.

[D02.N0] D6046

acute ecotoxicity, *n*—the propensity of a test material to produce adverse behavioral, biochemical, or physiological effects in non-human organisms or populations in a short period, usually not constituting a substantial portion of their life span.

[D02.N0] D8029

acute ecotoxicity test, *n*—a comparative ecotoxicity test in which a representative subpopulation of organisms is exposed to different treat rates of a test material and is observed for a short period, usually not constituting a substantial portion of their life span.

[D02.N0] D8029

acute toxicity test, *n*—a comparative toxicity test in which a representative subpopulation of organisms is exposed to different treat rates of a test material and is observed for a short period usually not constituting a substantial portion of their life span.

[D02.12] D6081

additive, *n*—a material added to another, usually in a small amount, to impart or enhance desirable properties or to suppress undesirable properties.

[D02.B0] D6681

additive, *n*—*in aviation gasoline*, substance added to a base aviation gasoline in relatively small amounts that either enables that base aviation gasoline to meet the applicable specification properties or does not alter the applicable specification properties of that base aviation gasoline beyond allowable limits. **[D02.J0] D7826**

additive, *n*—*in diesel fuels and fuel oils, fuels*, a substance added to diesel fuel ~~or fuel oil~~ at a blend level not greater than 1 % by volume of the finished fuel.

DISCUSSION—

Additives are generally included in finished diesel fuel ~~or fuel oil~~ to enhance performance properties (for example, cetane number, lubricity, cold flow, etc.).

DISCUSSION—

Additives that contain hydrocarbon oil blended with other substances may exclude the hydrocarbon oil portion for determination of the volume percent of the additive in the finished fuel.

DISCUSSION—

Triglycerides (for example, vegetable oils, animal fats, greases, and so forth) have been found to cause fouling of fuel oil burning equipment. Similar fouling is expected in diesel engine applications and triglycerides are therefore not allowed as additives or components of additives. **[D02.E0] D975**

additive, *n*—*in fuel oils*, a substance added to fuel oil at a blend level not greater than 1 % by volume of the finished fuel.

DISCUSSION—

Additives are generally included in finished fuel oil to enhance performance properties (for example, stability, pour point, and so ~~forth~~) forth).

DISCUSSION—

Additives that contain hydrocarbon oil blended with other substances may exclude the hydrocarbon oil portion for determination of the volume percent of the finished fuel.

DISCUSSION—

Triglycerides (for example, vegetable oils, animal fats, greases, and so forth) have been found to cause fouling of fuel oil burning equipment, and triglycerides are therefore not allowed as additives or components of additives. **[D02.E0] D396**

DISCUSSION—

Additives are generally included in finished fuel oil to enhance performance properties (for example, cetane number, lubricity, cold flow, etc.). **[D02.E0] D975**

additive, *n*—*in liquid fuels*, a component used in a finished fuel at 1 % by volume (volume fraction) or less that is included to enhance performance properties of the fuel or to comply with a requirement of the finished fuel.

DISCUSSION—

Dilution of an additive to facilitate handling may be needed. The volume of the diluent is not considered part of the dosage of the additive for the purpose of determining the concentration of the additive. **[Coordinating Subcommittee D02.95]**

adenosine monophosphate, *n*—molecule formed by the removal of two (2) molecules of phosphate (one pyrophosphate molecule) from ATP. **[D02.14] D7463**

adenosine monophosphate (AMP), *n*—molecule formed by the removal of two molecules of phosphate (one pyrophosphate molecule) from ATP. **[D02.14] D7687**

adenosine triphosphate, *n*—molecule comprised of a purine and three phosphate groups, that serves as the primary energy transport molecule in all biological cells. **[D02.14] D7463**

adenosine triphosphate (ATP), *n*—molecule comprised of a purine and three phosphate groups that serves as the primary energy transport molecule in all biological cells. **[D02.14] D7687**

adhesive wear (scuffing), *n*—wear due to localized bonding between contacting solid surfaces leading to material transfer between the two surfaces or loss from either surface. **[D02.B0] D8074; [D02.L0] D5182**

adiabaticity, *n*—the condition in which there is no significant gain or loss of heat throughout the length of the column.

DISCUSSION—

When distilling a mixture of compounds as is the case of crude petroleum, there will be a normal increase in reflux ratio down the column. In the case where heat losses occur in the column, the internal reflux is abnormally greater than the reflux in the head. The opposite is true when the column gains heat, as with an overheated mantle. **[D02.08] D2892**

adjustment, *n*—operation of bringing the portable digital density meter to a state of performance suitable for its use, by setting or adjusting the instrument constants. **[D02.04] D7777**

aerobe, *n*—an organism that requires oxygen to remain metabolically active.

DISCUSSION—

Aerobes use oxygen as their terminal electron acceptor in their primary energy-generating metabolic pathways. Aerobes require oxygen for survival, using *aerobic* metabolic processes to generate energy for growth and survival. **[D02.14] D6469**

aerobic, *adj*—(1) taking place in the presence of oxygen; (2) living or active in the presence of oxygen.

[D02.12] D5864, D6006, D6139, D6731; [D02.N0] D6046; [D02.14] D8070

agglomerate, *n*—*in manufactured carbon and graphite product technology*, composite particle containing a number of grains. **[D02.F0] D8075**

aggressiveness index (A.I.), *n*—the value computed from the sum of the pH + log alkalinity + log hardness of water sample where both alkalinity and hardness are reported as milligrams CaCO₃L.

DISCUSSION—

As A.I. decreases, water becomes more corrosive. At A.I. ≥ 12, water is noncorrosive. At 10 ≤ A.I. < 12, water is moderately corrosive. At A.I. < 10, water is strongly corrosive. **[D02.14] D6469**

air-fuel ratio, *n*—*in internal combustion engines*, the mass ratio of air-to-fuel in the mixture being induced into the combustion chambers.

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[D02.B0] D6593, D6709, D6837, D7589, D8111, D8114, D8226

DISCUSSION—

In this test method, air-fuel ratio (AFR), is controlled by the EEC IV engine control module. **[D02.B0] D6593**

alarm, *n*—means of alerting the operator that a particular condition exists. **[D02.96] D7720**

aliphatic ether, *n*—an oxygen-containing, ashless, organic compound in which the oxygen atom is interposed between two carbon atoms (organic groups), has the general formula C_{*n*}H_{2*n*+2}O with *n* being 5 to 8, and in which the carbon atoms are connected in open chains and not closed rings.

DISCUSSION—

Aliphatic compounds can be straight or branched chains and saturated or unsaturated. The term aliphatic ether, as used in this specification, refers only to the saturated compounds. **[D02.A0] D5797**

aliquot, *n*—portion of sample being tested that is a representative portion of the whole. **[D02.25] D7808**

alloy, *n*—unique composition of two or more metals that has one or more of the metals treated or processed in a special way to confer enhanced performance characteristics on the resulting material. **[D02.96] D8182**

alpha corrections, *n*—influence correction factors that compensate for inter-element X-ray matrix effects; alpha corrections may be determined by best-fit regression, XRF Fundamental Parameters (FP), or XRF theory (called theoretical alphas). **[D02.03] D8252**

alternative blendstock, *n*—*in fuel oils*, a non-hydrocarbon oil substance added to fuel oil at blend levels greater than 1 % by volume of the finished fuel.

DISCUSSION—

An alternative blendstock should normally have an industry consensus standard or an annex in this specification that defines its physical and chemical properties.

DISCUSSION—

See Appendix X3 for guidance regarding new materials for No. 1 and No. 2 grades of fuel oils.

[D02.E0] ~~D396, D975~~

alternative blendstock, *n*—*in diesel fuels and fuel oils*, a non-hydrocarbon oil substance added to diesel fuel and fuel oil at blend levels greater than 1 % by volume of the finished fuel.

DISCUSSION—

An alternative blendstock should normally have an industry consensus standard or an annex in this specification that defines its physical and chemical properties.

DISCUSSION—

See Appendix for guidance regarding new materials for #1-D and #2-D grades of diesel fuels.

[D02.E0] D975

amine number of reference fuels above 100, AN—AN, *n*—determined in terms of the weight percent of 3-methylphenylamine in reference grade *isooctane* (2,2,4-trimethylpentane). For example, 5 % of 3-methylphenylamine in reference grade *isooctane* has an amine number of 105 (AN 105). No attempt has been made to correlate performance number of leaded reference fuels to the amine number of unleaded reference fuels, and none is implied.

[D02.J0] D6424, D6812

ampule, *n*—a glass vessel for the storage of liquid materials, possessing a long narrow neck for the purpose of providing a flame-sealed closure.

[D02.04] D6596

anaerobe, *n*—an organism that cannot grow or proliferate in the presence of oxygen.

DISCUSSION—

Anaerobes use molecules other than oxygen in their primary energy-generating metabolic pathways, such as sulfate, nitrate, ketones, and other high-energy organic molecules. Although anaerobes may survive in the presence of oxygen, anaerobic growth typically occurs only in an oxygen depleted environment.

[D02.14] D6469

[ASTM D4175-20ae1](https://standards.iteh.ai/catalog/standards/sist/08977d24-ee47-47e0-95fd-792011aa80d5/astm-d4175-20ae1)

anaerobic, *adj*—(1) taking place in the absence of oxygen; (2) living or active in the absence of oxygen.

[D02.12] D6006; [D02.N0] D6046

analysis, *n*—in the context of this practice, the process of applying the calibration model to a spectrum, preprocessed as required, so as to estimate a component concentration value or property.

[D02.25] D8340

analysis cycle time, *n*—the period of time required to properly obtain and analyze a representative sample of the process stream material.

[D02.25] D6624

analysis sample, *n*—the reduced and divided representative portion of the bulk sample, prepared for use in the laboratory.

[D02.05] D4930, D6969

analyte, *n*—a specific compound to be measured quantitatively in a mixture of compounds.

[D02.04] D7920

analytical column, *n*—a chromatographic column used to further separate a specific analyte from a mixture of compounds which can coelute in the primary column.

[D02.04] D7920

analytical column, *n*—porous layer open tubular (PLOT) column with a stationary phase selective for oxygenates. It is used to resolve methanol from 1-propanol to provide accurate quantitative results.

[D02.04] D7059

analytical detector, *n*—a device used to quantify the compounds of interest after they elute from the analytical column. [D02.04] D7920

analytical measurement system, *n*—a collection of one or more components or subsystems, such as sample handling and preparation, test equipment, instrumentation, display devices, data handlers, printouts or output transmitters, that are used to determine a quantitative value of a specific property for an unknown sample in accordance with a standard test method. [D02.94] D7372

analytical measurement system, *n*—a collection of one or more components or subsystems, such as samplers, test equipment, instrumentation, display devices, data handlers, and printouts or output transmitters, that is used to determine a quantitative value of a specific property for an unknown sample in accordance with a test method.

[Subcommittee D02.94]

DISCUSSION—

ASTM or ISO standard test methods are examples of a test method.

DISCUSSION—

In the context of this test method, the analytical measurement system is comprised of the knock testing unit, automated analyzer system, and any auxiliary equipment required for the safe operation of the engine. [D02.01] D2885

analyzer, *n*—all piping, hardware, computer, software, instrumentation and calibration model required to automatically perform the analysis of a process or product stream. [D02.25] D8340

analyzer system, *n*—the complete analyzer system inclusive of the sample loop, sample conditioning unit, analyzer unit, readout instrumentation, and excess sample return system (see Fig. 1 from Practice D3764 for example). [D02.25] D8340

analyzer unit response time, *n*—time interval between the introduction of a step change in property characteristic at the inlet of the analyzer unit and when the analyzer output indicates a value corresponding to 99.5 % of the subsequent change in analyzer results. [D02.25] D7453

aniline point, *n*—the minimum equilibrium solution temperature for equal volumes of aniline and sample. [D02.04] D611

annulus—a cut gasket shape consisting of two concentric circles of known geometry. [D02.B0] F118

anoxic, *adj*—oxygen free. [D02.14] D6469

antibody, *n*—an immunoglobulin, a protein that is produced as a part of the immune response which is capable of specifically combining with the antigen.

DISCUSSION—

In the context of this test method, antibodies created for this purpose are utilized in conjunction with visual indicators to detect presence of microbial antigens. [D02.14] D8070

antifreeze, *n*—antifreeze is typically a dilution of ethylene glycol and possibly other glycols, and additives, in water to act as a machine coolant. 1,2-propanediol is found in some antifreeze formulations. [D02.04] D7922

antigen, *n*—a substance that stimulates the host to produce an immune response. In the context of this test method, specific antigens are detected as indicators of microbial contamination. [D02.14] D8070

antiknock index, *n*—the arithmetic average of the Research octane number (RON) and Motor octane number (MON), that is, $(RON + MON)/2$. [D02.A0] D4814

antimicrobial, *n*—see **biocide**.

[D02.14] D6469

antinodes, *n*—two or more locations that have local maximum displacements, called antinodes, in an unconstrained slender rod or bar in resonance. For the fundamental flexure resonance, the antinodes are located at the two ends and the center of the specimen.

[D02.F0] C747

API gravity, *n*—special function of relative density (specific gravity) SG_{60 °F/60 °F}, represented by:

$$^{\circ}\text{API} = 141.5 / (\text{SG}_{60\text{ }^{\circ}\text{F}/60\text{ }^{\circ}\text{F}} - 131.5)$$

$$^{\circ}\text{API} = 141.5 / (\text{SG}_{60\text{ }^{\circ}\text{F}/60\text{ }^{\circ}\text{F}}) - 131.5$$

DISCUSSION—

Relative density SG_{15 °C/15 °C} is also applied.

[D02.04] D7777

apparent density, *n*—the weight per unit volume of a substance, including voids inherent in the material tested. [D02.05] D5502

apparent viscosity, *n*—the determined viscosity obtained by use of this test method.

[D02.07] D3829, D4684, D5133, D6821, D6896

DISCUSSION—

Apparent viscosity may vary with the spindle speed (shear rate) of a rotational viscometer if the fluid is non-Newtonian. See Appendix X1 for a brief explanation.

[D02.07] D2983

apparent viscosity, *n*—of a lubricating grease is the ratio of shear stress to shear rate calculated from Poiseuille's equation, and is measured in poises.

[D02.G0] D1092

apparent viscosity, *n*—the viscosity determined by this test method and expressed in milliPascal seconds. Its value may vary with the spindle and rotational speed selected because many hot melts are non-Newtonian.

[D02.10] D3236

apparent viscosity, *n*—the viscosity obtained by use of this test method.

[D02.07] D7110

apparent viscosity, *n*—viscosity of a non-Newtonian liquid determined by this test method at a particular shear rate and shear stress.

[D02.07] D4683, D4741, D5481

area slice, *n*—area under a chromatogram within a specified retention time interval.

[D02.04] D7096

area slice, *n*—in *gas chromatography*, the area, resulting from the integration of the chromatographic detector signal, within a specified retention time interval.

[D02.04] D7798

area-normalized oxidation rate (OR_a)—rate of weight loss due to oxidation of a machined test specimen at a given temperature, divided by the nominal geometric surface area of the specimen.

DISCUSSION—

The rate of weight loss is determined by a linear fit of the weight loss plotted against time in the range from 5 % to 10 % loss of original specimen weight. The units of area-normalized oxidation rate, OR_a, are g h⁻¹ m⁻².

[D02.F0] D7542

area-normalized standard oxidation rate (SOR_a)—value of area normalized oxidation rate corresponding to 1 % weight loss in 24 h. Area-normalized standard oxidation rate, SOR_a, depends on the initial specimen density. For carbon and graphite samples (density 1.2 – 2.2 g cm⁻³) SOR_a varies between 2 and 4 g h⁻¹ m⁻².

[D02.F0] D7542

aromatics, *n*—in *high performance liquid chromatography*, aromatic hydrocarbon components, minus polar material, that has a longer retention time than saturates on the specified polar columns, but can be removed as a single peak by backflushing the columns with heptane.

DISCUSSION—
Generally, aromatic hydrocarbons contain 1 to 4 rings. [D02.04] D7419

aromatics fraction, *n*—portion of the sample desorbed with the polar eluants. The aromatics fraction is divided into nonpolar and polar based. They may contain aromatics, condensed naphthenic-aromatics, aromatic olefins, and compounds containing sulfur, nitrogen, and oxygen atoms. [D02.12] D7373

as-calcined particles, *n*—of coke, those particles that have not been subject to laboratory crushing. [D02.05] D7454

aseptic, *adj*—sterile, free from viable microbiological contamination. [D02.14] D6974, D7463, D7464, D7687

ash, *n*—in carbon and graphite technology, residue remaining after oxidation of a carbon or graphite. [D02.F0] C561

asphalt, *n*—a dark brown-to-black cementitious material in which the predominating constituents are bitumens.

DISCUSSION—
Asphalt can be a natural product or a material obtained from petroleum processing. [D02.G0] D128

asphalt, *n*—in North American usage, (1) the heavy, black, viscous hydrocarbon-based material used for roofing and paving or (2) mixtures of that material with aggregate or (3) finished paving.

DISCUSSION—
Asphalt free of aggregate is of three types: (1) natural asphalt, (2) asphalt from the processing of crude oils, and (3) asphalt that has been modified by blowing with air or other means. Natural asphalt is obtained from tar pits or tar lakes, such as those in Trinidad. In the refinery, asphalt is usually the residual portion of asphaltic crude oil obtained as bottoms from vacuum distillation or by propane deasphalting. Either of these types of asphalt can be air blown for further removal of lighter fractions and for mild oxidation, to modify the properties of the final product.

[Coordinating Subcommittee D02.95]

asphaltenes, *n*—(rarely used in the singular)—in petroleum technology, represent an oil fraction that is soluble in a specified aromatic solvent but separates upon addition of an excess of a specified paraffinic solvent.

DISCUSSION—
In this test method, the aromatic solvent is hot toluene and the paraffinic solvent is heptane.

DISCUSSION—
Historically, benzene was the aromatic solvent, but benzene is not typically used now for health reasons. The precision of this test method when using toluene has been found to be the same as when using benzene. [D02.14] D6560

DISCUSSION—
In this test method, the aromatic solvent is toluene and the paraffinic solvent is heptane. [D02.14] D7061, D7827, D7996

DISCUSSION—
In this test method, the aromatic solvent is toluene and the paraffinic solvent is n-heptane. [D02.14] D7157

DISCUSSION—
In this test method, the aromatic solvent is xylene and the paraffinic solvent is n-heptane. [D02.14] D7112

DISCUSSION—
In this test method, the aromatic solvent is 1-methylnaphthalene, and the paraffinic solvent is n-hexadecane. [D02.14] D7060

DISCUSSION—
Asphaltenes are found largely in crude oils and in heavy fuel oils containing residual fractions. They are insoluble in alkanes such as heptane and pentane, but soluble in aromatic solvents such as benzene or toluene. [D02.14] D8253

assay, *n*—the procedure to determine the presence, absence, or quantity of one or more components. [D02.02] D4057

assignable cause, *n*—factor that contributes to variation in a process or product output that is feasible to detect and identify; also called *special cause*. [D02.96] D7720

assigned test value (ATV), *n*—the average of all results obtained in the several laboratories which are considered acceptable based on the reproducibility of the test method. [D02.94] D3244

ASTM color, *n*—the name of an empirical scale of expressing the color of a petroleum liquid darker than Saybolt color based on a scale of 0.5 (lightest) to 8 Dil (darkest) and determined by Test Method D1500. [D02.05] D6045, D6756

atomic absorption spectrometry, *n*—analytical technique for measuring metal content of solutions, based on a combination of flame source, hollow cathode lamp, photomultiplier, and a readout device. [D02.03] D7740

atomizer, *n*—usually a flame source used to decompose the chemical constituents in a solution to its elemental components. [D02.03] D7740

audit, *n*—a systematic examination of the laboratory’s quality management system documentation and related activities by an internal or external team to determine conformance to the applicable quality management system standard, such as described in this practice. [D02.94] D6792

autoignition, *n*—the ignition of a material commonly in the air as the result of a heat liberation due to the exothermic oxidation reaction in the absence of an external ignition source, such as a spark or flame. [Subcommittee D02.01]; [D02.N0] D2155

autoignition temperature, *n*—the minimum temperature at which autoignition occurs under the specified conditions of the test. [D02.N0] D2155

automatic sample collector, *n*—device used to repetitively extract a grab and collect a representative sample of a batch or process stream. [D02.25] D7453

automatic sampler, *n*—a device used to extract a representative sample from the liquid flowing in a pipe; the automatic sampler generally consists of a probe, a sample extractor, an associated controller, a flow measuring device, and a sample receiver. [D02.02] D4057

automatic sampling system, *n*—system consisting of a sample probe, sample fast cycle loop, sample supply line stream conditioning, an automatic sampler and an associated controller, a flow measuring device, and sample holding, mixing and handling capabilities. [D02.25] D7453

automotive, *adj*—descriptive of equipment associated with self-propelled machinery, usually vehicles driven by internal combustion engines. [D02.B0] D4485, D6709, D7216, D8111, D8114, D8226

automotive fuel rating, *n*—the automotive fuel rating required under the amended Octane Certification and Posting Rule (or as amended, the Fuel Rating Rule), 16 CFR, Part 306.

DISCUSSION—

Under this Rule, sellers of liquid automotive fuels, including alternative fuels, must determine, certify, and post an appropriate automotive fuel rating. The automotive fuel rating for gasoline is the antiknock index (octane rating). The automotive fuel rating for alternative liquid fuels consists of the common name of the fuel along with a disclosure of the amount, expressed as a minimum percentage by volume, of the principal component of the fuel. For alternative liquid automotive fuels, a disclosure of other components, expressed as a minimum percentage by volume, may be included, if desired. This is applicable in the United States. [D02.A0] D7794

automotive wheel bearing grease, *n*—a lubricating grease specifically formulated to lubricate automotive wheel bearings at relatively high grease temperatures and bearing speeds. [D02.G0] D4693

aviation gasoline, *n*—fuel derived from petroleum or non-petroleum materials possessing specific properties suitable for operating aircraft powered by spark-ignition piston engines.

DISCUSSION—

Principal properties include combustion, fluidity, volatility corrosion, stability, water shedding, and detonation-free performance in the engine (or engines) for which it is intended. In the context of this guide, the terms fuel and gasoline are interchangeable. [D02.J0] D7826

aviation gasoline, *n*—gasoline possessing specific properties suitable for fueling aircraft powered by reciprocating spark ignition engines.

DISCUSSION—

Principal properties include volatility limits, stability, detonation-free performance in the engine for which it is intended and suitability for low temperature performance.

[D02.J0] D910, D6227

aviation turbine fuel, *n*—refined petroleum distillate, generally used as a fuel for aviation gas turbines.

DISCUSSION—

Different grades are characterized by volatility ranges, freeze point, and by flash point.

[D02.J0] D1322

B6 to B20, *n*—fuel blend consisting of 6 volume percent to 20 volume percent biodiesel conforming to the requirements of Specification D6751 with the remainder being a light middle or middle distillate grade diesel fuel and meeting the requirements of this specification.

DISCUSSION—

The abbreviation BXX represents a specific blend concentration in the range B6 to B20, where XX is the percent volume of biodiesel in the fuel blend.

[D02.E0] D7467

backflush, *v*—elution of the HPLC mobile phase in the backward or reverse direction from the silica gel column towards the cyano column.

DISCUSSION—

In this test method, it is used to elute the total aromatics plus polars as one sharp component.

[D02.04] D7419

background RLU, *n*—quantity of relative light units resulting from running the test method without incorporation of the sample.

[D02.14] D7687

bacterium (pl. bacteria), *n*—a single cell microorganism characterized by the absence of defined intracellular membranes that define all higher life forms.

DISCUSSION—

All bacteria are members of the biological diverse kingdoms *Prokaryota* and *Archaeobacteriota*. Individual taxa within these kingdoms are able to thrive in environments ranging from sub-zero temperatures, such as in frozen foods and polar ice, to superheated waters in deep-sea thermal vents, and over the pH range <2.0 to >13.0. Potential food sources range from single carbon molecules (carbon dioxide and methane) to complex polymers, including plastics. Oxygen requirements range from obligate anaerobes, which die on contact with oxygen, to obligate aerobes, which die if oxygen pressure falls below a species specific threshold.

[D02.14] D6469

base fuel, *n*—*in automotive spark-ignition engine fuels*, a material composed primarily of hydrocarbons that may also contain oxygenates, anti-oxidants, corrosion inhibitors, metal deactivators, and dyes but does not contain deposit control or lead additives.

DISCUSSION—

A jurisdiction may set limits on lead content from all sources.

[D02.A0] D5500, D6201

base number, *n*—the quantity of a specified acid, expressed in terms of the equivalent number of milligrams of potassium hydroxide per gram of sample, required to titrate a sample in a specified solvent to a specified endpoint using a specified detection system.

[D02.06] D2896, D8126

DISCUSSION—

In this test method, the indicator is *p*-naphtholbenzein titrated to an orange end point in a toluene-water-isopropanol solvent.

[D02.06] D974

DISCUSSION—

This test method uses fixed amounts of *isooctane* and alcoholic hydrochloric acid as the sample solvent and the endpoint is defined as the amount of titrant required to reach a yellow endpoint with a methyl red indicator solution.

[D02.06] D5984

DISCUSSION—

In this test method, the sample is titrated to a meter reading corresponding to aqueous acidic buffer solution or appropriate inflection point.

[D02.06]

D4739

base oil, *n*—a base stock or a blend of two or more base stocks used to produce finished lubricants, usually in combination with additives. [D02.P0] D6074

base peak of a compound—the peak used as 100 % in computing the cracking pattern coefficient. [D02.04] D2650

base stock, *n*—a hydrocarbon lubricant component, other than an additive, that is produced by a single manufacturer to the same specifications (independent of feed source or manufacturer’s location), and that is identified by a unique formula number or product identification number, or both.

[D02.P0] D6074

basicity, *n*—the quality, state or degree of being basic.

DISCUSSION—

In this test method, the criterion for basicity is a pink or red color when phenolphthalein indicator is used.

[D02.06] D1093

basis weight of paper, *n*—basis weight is expressed in grams per square metre. In countries where the metric system is not universal, basis weight is also expressed in pounds per ream. [D02.10] D2423

batch—all the O-rings molded from the same lot of material and presented for inspection at one time. [D02.N0] D6546

batch, *n*—term referring to a volume or parcel being transferred. [D02.25] D7453

bearing failure, *n*—the termination of the bearing’s ability to perform its design function. [D02.96] D7973, D8128

bearing failure initiation, *n*—the moment a bearing starts to perform outside of its design function measured by performance characteristics. [D02.96] D7973, D8128

between ILCP method-averages reproducibility ($R_{ILCP, X, ILCP, Y}$), *n*—a quantitative expression of the random error associated with the difference between the bias-corrected ILCP average of method X versus the ILCP average of method Y from a Proficiency Testing program, when the method X has been assessed versus method Y, and an appropriate bias-correction has been applied to all method X results in accordance with this practice; it is defined as the numerical limit for the difference between two such averages that would be exceeded in about 5 % of the time (one case in 20 in the long run). [D02.94] D6708

between-method bias, *n*—a quantitative expression for the mathematical correction that can statistically improve the degree of agreement between the expected values of two test methods which purport to measure the same property. [D02.94] D6708

between-method reproducibility (R_{XY}), *n*—quantitative expression of the random error associated with the difference between two results obtained by different operators using different apparatus and applying the two methods X and Y, respectively, each obtaining a single result on an identical test sample, when the methods have been assessed and an appropriate bias-correction has been applied in accordance with this practice; it is defined as the 95 % confidence limit for the difference between two such single and independent results. [D02.25] D6122

between-methods reproducibility (R_{XY}), *n*—a quantitative expression of the random error associated with the difference between two results obtained by different operators using different apparatus and applying the two methods X and Y, respectively, each obtaining a single result on an identical test sample, when the methods have been assessed and an appropriate bias-correction has been applied in accordance with this practice; it is defined as the numerical limit for the difference between two such single and independent results that would be exceeded about 5 % of the time (one case in 20 in the long run) in the normal and correct operation of both test methods.

DISCUSSION—

A statement of between methods reproducibility must include a description of any bias correction used in accordance with this practice.

DISCUSSION—

Between methods reproducibility is a meaningful concept only if there are no statistically observable sample-specific relative biases between the two methods, or if such biases vary from one sample to another in such a way that they may be considered random effects. [D02.94] D6708

binary, *adj*—characterized by, or consisting of, two components. [D02.J0] D7719

binder—a component of certain gasket materials, which solidifies the structure, imparts uniform adhesion to surfaces, and has an impact on the pore structure and resiliency. [D02.B0] F118

binder, *n*—substance such as coal tar pitch or petroleum pitch, used to bond the coke or other filler material prior to baking. [D02.F0] D8075

bioaccumulation, *n*—the net accumulation of a substance by an organism as a result of uptake from all environmental sources. [D02.N0] D7044, D8029

bioburden, *n*—the level of microbial contamination (*biomass*) in a system.

DISCUSSION—

Typically, bioburden is defined in terms of either biomass or numbers of cells per unit volume or mass or surface area material tested (g biomass/mL; g biomass/g; cells/mL sample, and so forth). The specific parameter used to define bioburden depends on critical properties of the system evaluated and the investigator's preferences. [D02.14] D6469

biochemical oxygen demand (BOD), *n*—the mass concentration of dissolved oxygen consumed under specified conditions by the biological oxidation of organic or inorganic matter, or both.

DISCUSSION—

BOD determination is performed using empirical tests employing standardized laboratory procedures. These tests measure oxygen utilization during a specified incubation period for the biochemical degradation of organic material (carbonaceous demand) in water. [D02.12] D6731

biocide, *n*—a poisonous substance that can kill living organisms.

DISCUSSION—

Biocides are further classified as bactericides (kill bacteria), fungicides (kill fungi), and microbiocides (kill both bacteria and fungi). They are also referred to as *antimicrobials*. [D02.14] D6469

biodegradability, *n*—ability of a substance to be broken down into simpler substances by bacteria. [D02.12] D7373

biodegradable, *adj*—any substance containing <10 % wt. O₂ content which undergoes ≥60 % biodegradation as theoretical CO₂ in 28 days and ≥67 % biodegradation as theoretical O₂ uptake in 28 days, or any hydraulic fluid containing ≥10 % wt. O₂ content which undergoes ≥60 % biodegradation as theoretical CO₂ or as theoretical O₂ uptake in 28 days. [D02.N0] D7044

biodegradation, *n*—the process of chemical breakdown or transformation of a material caused by organisms or their enzymes. [D02.12] D6006, D6139, D7044; [D02.N0] D6046;

DISCUSSION—

Biodegradation is only one mechanism by which materials are transformed in the environment. [D02.12] D5864; [D02.N0] D8029

biodegradation, *n*—the process of chemical breakdown or transformation of a test material caused by microorganisms or their enzymes.

DISCUSSION—

Biodegradation is only one mechanism by which materials are removed, transformed, or both, in the environment. [D02.12] D6731

biodeterioration, *n*—the loss of commercial value or performance characteristics, or both, of a product (fuel) or material (fuel system) through biological processes. [D02.14] D6469

biodiesel, *n*—fuel comprised of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated B100.

[D02.01] ~~D6890, D7170~~; [D02.04] **D7398, D7861;**
 [D02.08] **D93; [D02.14] D7501, D7321;**
 [D02.E0] **D396, D975, D7467; D8181**

DISCUSSION—

Biodiesel, as defined above, is registered with the U.S. EPA as a fuel and a fuel additive under Section 211(b) of the Clean Air Act 40 CFR Part 79). There is, however, other usage of the term biodiesel in the marketplace. Due to its EPA registration and the widespread commercial use of the term biodiesel in the U.S. marketplace, the term biodiesel will be maintained for this specification.

DISCUSSION—

Biodiesel is typically produced by a reaction of a vegetable oil or animal fat with an alcohol such as methanol or ethanol in the presence of a catalyst to yield mono-alkyl esters and glycerin, which is removed. The finished biodiesel derives approximately 10 % of its mass from the reacted alcohol. The alcohol used in the reaction may or may not come from renewable resources. **[D02.E0] D6751;**

DISCUSSION—

~~Biodiesel is typically produced by a reaction of vegetable oil or animal fat with an alcohol such as methanol or ethanol in the presence of a catalyst to yield mono-esters and glycerin. The fuel typically may contain up to 14 different types of fatty acids that are chemically transformed into fatty acid methyl esters (FAME).~~ **[D02.07] D5771, D5772, D5773, D7397, D7683, D7689**

biodiesel, *n*—a fuel composed of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated B100 in Specification D6751. **[D02.04] D7806**

biodiesel (B-100), *n*—fuel comprised of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats. **[D02.04] D6584**

biodiesel blend, *n*—a blend of biodiesel fuel with petroleum-based diesel fuel designated BXX, where XX is the volume % of biodiesel. **[D02.07] D5771, D5772, D5773**

biodiesel blend (BXX), *n*—blend of biodiesel fuel with diesel fuel oils.

DISCUSSION—

In the abbreviation, BXX, the XX represents the volume percentage of biodiesel fuel in the blend.

[D02.01] ~~D6890, D7170~~; [D02.04] **D7861;**
 [D02.E0] **D396, D6751**

biodiesel blend (BXX), *n*—blend of biodiesel fuel with diesel fuels and fuel oils.

DISCUSSION—

In the abbreviation, BXX, the XX represents the volume percentage of biodiesel fuel in the blend. **[D02.E0] D975; [D02.07] D5771, D5772, D5773, D7397, D7683, D7689**

biodiesel blend (BXX), *n*—blend of biodiesel fuel with petroleum-based diesel fuel designated BXX, where XX is the volume percentage (as a whole number without the percentage sign) of biodiesel; a homogeneous mixture of hydrocarbon oils and mono-alkyl esters of long chain fatty acids.

DISCUSSION—

The mono-alkyl esters of long chain fatty acids (that is, biodiesel) used in the mixture shall meet the requirements of Specification D6751.

DISCUSSION—

Diesel fuel, fuel oil, and non-aviation gas turbine oil are examples of hydrocarbon oils. **[D02.07][D02.E0] D7397D6751, D7683**

biodiesel blend, BXX, *n*—a blend of biodiesel fuel with petroleum-based diesel fuel.

DISCUSSION—

In the abbreviation BXX, the XX represents the volume percentage of biodiesel fuel in the blend.

[D02.04] D7806

biodiesel blend, BXX, *n*—a fuel composed of biodiesel blendstock with hydrocarbon-based diesel fuel.

[D02.14] D7321