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Standard Terminology Relating to Carbon Black[1]

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1. Scope

1.1 This terminology covers a compilation of definitions of technical terms used in the carbon black and rubber industries. Terms that are generally understood or adequately defined in other readily available sources are not included.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D 1508 Test Method for Carbon Black, Pelleted Fines and Attrition
D 1509 Test Methods for Carbon BlackHeating Loss
D 1510 Test Method for Carbon BlackIodine Adsorption Number
D 1511 Test Method for Carbon BlackPellet Size Distribution
D 1513 Test Method for Carbon Black, PelletedPour Density
D 1514 Test Method for Carbon BlackSieve Residue
D 1566 Terminology Relating to Rubber
D 1618 Test Method for Carbon Black ExtractablesTransmittance of Toluene Extract
D 1765 Classification System for Carbon Blacks Used in Rubber Products
D 1799 Practice for Carbon BlackSampling Packaged Shipments
D 1900 Practice for Carbon BlackSampling Bulk Shipments
D 1937 Test Method for Carbon Black, PelletedMass Strength
D 2414 Test Method for Carbon BlackOil Absorption Number (OAN)
D 2663 Test Methods for Carbon BlackDispersion in Rubber ~~D3037 Test Methods for Carbon Black—Surface Area by Nitrogen Adsorption~~
D 3265 Test Method for Carbon BlackTint Strength
D 3313 Test Method for Carbon BlackIndividual Pellet Hardness
D 3493 Test Method for Carbon BlackOil Absorption Number of Compressed Sample (COAN)
D 3849 Test Method for Carbon BlackMorphological Characterization of Carbon Black Using Electron Microscopy ~~D4820 Test Methods for Carbon Black-Surface Area by Multipoint B.E.T. Nitrogen Adsorption~~[0]

[1] This terminology is under the jurisdiction of ASTM Committee D24 on Carbon Black and is the direct responsibility of Subcommittee D24.41 on Carbon Black Nomenclature and Terminology.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

D 5230 Test Method for Carbon BlackAutomated Individual Pellet Hardness D5816 Test Methods for Carbon Black-External Surface Area by Multipoint Nitrogen Adsorption[0]

D 6086 Test Method for Carbon BlackVoid Volume (VV)

D 6556 Test Method for Carbon BlackTotal and External Surface Area by Nitrogen Adsorption

D 6602 Practice for Sampling and Testing of Possible Carbon Black Fugitive Emissions or Other Environmental Particulate, or Both

3. Terminology

3.1 *Definitions:*

aciniform, *adj*—shaped like a cluster of grapes.

DISCUSSION—The spheroidal primary particles of carbon black are fused into aggregates of colloidal dimension forming an aciniform morphology.

carbon black, *n*—an engineered material, primarily composed of elemental carbon, obtained from the partial combustion or thermal decomposition of hydrocarbons, existing as aggregates of aciniform morphology which are composed of spheroidal primary particles, uniformity of primary particle sizes within a given aggregate, and turbostratic layering within the primary particles.

DISCUSSION—Particle size and aggregate size (number of particles per aggregate) are distributional properties and vary depending on the carbon black grade. Transmission electron micrographs shown in Annex A1 of Practice D 6602 demonstrate that while particle and aggregate sizes vary greatly within a given grade of carbon black, the primary particle size is essentially uniform within an individual aggregate.

carbon black, carcass grade, *n*—a type of furnace carbon black having an average particle size in the range from 31 to 200 nm. —a type of furnace carbon black having an average nitrogen surface area in the range of 21 to 69 m^2/g.

DISCUSSION—Carcass-grade carbon blacks are produced by the oil furnace process. The use of these grades in the rubber industry is not limited to the carcass portion of the tire. These grades are designated with an "N" first character and a second character of "4, 5, 6, or 7" in Table 1 of Classification D 1765. See Terminology D 1566 for the definition of carcass.

carbon black, furnace, *n*—a type of carbon black produced by the decomposition reaction of hydrocarbons when injected into a high-velocity stream of combustion gases under controlled conditions.

carbon black, hard, *n*—See **carbon black, tread grade**, the preferred term.

DISCUSSION—All carbon blacks provide some level of reinforcement when mixed in rubber. The amount of reinforcement is a function of the carbon black grade and amount used. See Terminology D 1566 for the definition of reinforcement.

carbon black, semi-reinforcing, *n*— See **carbon black, carcass grade**, the preferred term.

DISCUSSION—All carbon blacks provide some level of reinforcement when mixed in rubber. The amount of reinforcement is a function of the carbon black grade and amount used. See Terminology D 1566 for the definition of reinforcement.

carbon black, soft, *n*—See **carbon black, carcass grade**, the preferred term.

DISCUSSION—All carbon blacks provide some level of reinforcement when mixed in rubber. The amount of reinforcement is a function of the carbon black grade and amount used. See Terminology D 1566 for the definition of reinforcement.

carbon black, surface activity, *n*— the inherent ability of the carbon black surface to interact physically or chemically, or both, with rubber or other molecules.

carbon black, target value, *n*—a consensus value for selected primary properties on which producers center their manufacturing process and users center their specification.

DISCUSSION—Target values for carbon black properties are shown in Classification D 1765 for most rubber grade carbon blacks currently in commerce.

carbon black, thermal, *n*—a type of carbon black produced under controlled conditions by the thermal decomposition of hydrocarbons in the absence of air or flames.

DISCUSSION—These grades are designated with an "N" first character and a second character of "8 or 9" in Table 1 of Classification D 1765.

carbon black, thermal, acetylenic, *n*— a thermal black produced from acetylene gas.

carbon black, tread grade, *n*—a type of furnace carbon black having an average particle size in the range from 1 to 30 nm. —a type of furnace carbon black having an average nitrogen surface area of 70 m^2/g or greater.

DISCUSSION—Tread grade carbon blacks are produced by the oil furnace process. The use of these grades in the rubber industry is not limited to the tread portion of the tire. These grades are designated with an "N" first character and a second character of "0, 1, 2, or 3" in Table 1 of Classification D 1765.

carbon black, typical value, *n*—a consensus value for those carbon black properties that are not specifically targeted for control in the manufacturing process and that are somewhat dependent upon the targeted properties.