Edition February 2023

GENERAL INFORMATION

PentaCarbon GmbH is an internationally active company with the core business in the area of trade, distribution and production of Carbon Black. This focus allows us to provide you a complete portfolio of different Carbon Black grades.

Our comprehensive product portfolio contains over 200 grades of high quality Carbon Black alternatives to well-known global manufacturers. The portfolio can be divided in classical Rubber Carbon Blacks and Special Carbon Blacks with technical requirements.

Code of Conduct
As a common guideline for our decisions and actions, our Code of Conduct specifies minimum binding standards for responsible behavior with business partners, the general public as well as for the conduct within the company.

Social Responsibility
Economic success and social responsibility are two goals of our company that can not be separated. Responsible and ethical behavior towards employees, business partners, our society and the environment are an integral part of the core values of PentaCarbon GmbH.

Environmental Management
With all decisions and actions, PentaCarbon GmbH takes environmental protection into consideration. Our aim is to protect the environment and the natural livelihood of present and future generations and therefore implement our Environmental Guideline with daily commitment.

REACH
The European regulation REACH (Registration, Evaluation, Authorization and Restriction of Chemicals) is intended to ensure a high level of protection for humankind and the environment. PentaCarbon GmbH is fully committed to this initiative and has taken the necessary steps to comply with the requirements of this regulation.

Material Safety Data Sheets
According to Article 31.1 of the REACH regulation, a MSDS (Material Safety Data Sheet) must be available for hazardous substances or preparations. The latest version of the MSDS of PentaCarbon GmbH can be downloaded on our website **www.pentacarbon.de**

Quality Management – ISO
PentaCarbon GmbH is certified according to DIN EN ISO 9001:2015 and fulfills the highest quality standards with regard to operational management, internal work processes, occupational safety and environmental protection.

Quality Documents
For the above mentiomed quality documents, please visit our section downloads on **www.pentacarbon.de**

ESHQ - PRODUCT STEWARDSHIP

General Information and Phyiscal-Chemical Properties

Chemical Name:	Carbon Black
CAS Registry Number:	1333-86-4
EC List Number:	215-609-9
Harmonized System Code:	28030000
Chemical (Molecular) Formula:	C
Physical state:	Solid, powder or pellet
Pure elemental carbon:	96-99,5%
Solubillity:	Water: insoluble, Solvents: insoluble
Color:	Black

General Information:
All our Carbon Black grades are registered under EU REACH: 01-2119384822-32-XXXX.
Special (technical) requirements or compliance to any regulations should be communicated on forehand at all time, to be able to offer the appropriate Carbon Black grade. Individual analysis depending on grade and application on request.

REACH Regulation (EC) No 1907/2006 and Substances of Very High Concern (SVHC)

The EU Parliament adopted the regulatory framework for Registration, Evaluation and Authorisation of Chemicals, Regulation (EC) No 1907/2006, which requires manufacturers and/or importers to register chemicals substances.
Carbon Black (CAS# 1333-86-4, EINECS# 215-609-9) meets the definition of “substance” under Chapter 2, Article 3 of the REACH Regulation.

Our Carbon Blacks grades are registered under EU REACH: 01-2119384822-32-XXXX.

Under the EU REACH Regulation, Substances of Very High Concern (SVHC) should be documented if present at a concentration exceeding 0.1% in a substance such as Carbon Black (CAS#1333-86-4, EINECS# 215-609-9). We have reviewed ECHA’s SVHC list, and we believe that our products do not contain any of the SVHCs above the threshold concentration. Individual analysis on request.

https://echa.europa.eu/de/candidate-list-table

Restriction of the use of Hazardous Substances (RoHS) regulation (Directive 2011/65/EU)

The above directive prohibits the use of the following substances above the threshold levels shown below on the EU market:
- 0.1% by weight in homogenous materials (lead, mercury, hexavalent chromium, polybrominated, biphenyls (PBBs), and polybrominated diphenyl, ethers (PBDEs including Decabromodiphenyl ether Deca-BDE),; Bis (2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP), Dibutyl phthalate (DBP) and Diisobutyl phthalate (DiBP)
- 0.01% by weight inhomogenous materials – cadmium

To the best of our knowledge, the substances listed above are not present in Carbon Black products at concentrations at or above the threshold levels.

Individual analysis of PAH and Heavy Metals depending on grade and application on request.

Chemical inventories

Carbon Black (CAS number 1333-86-4) is listed in the following inventories:

Australia (NICNAS):	AICS
Canada (CEPA):	DLS, NDSL
China:	IECSC
Europe (EC):	EINECS (2015-609-9), ELINCS, NLP, EU REACH (1907/2006)

Germany (WGK):	VDI guideline 2580, Emission Control Production Plants for Carbon Black Classification of Carbon Black in Water: not water endangering
Japan (METI & MLHW):	ENCS, ISHL
New Zealand:	HSNO, NZIOC
Philippines:	PICCS
Korea (KCMA):	KECI, KECL, NIER, ECL, TCCL
Taiwan (ECN):	TSCI, ECN, CSNN
Turkey (KKDIK):	Turkey REACH
Ukraine:	All-Union Classifier of Industrial and Agricultural Products
United Kingdom:	UK REACH
United States (EPA:	TSCA
Taiwan (ECN):	TSCI, ECN

Substances of concern

The following substances are not used as sources in the feedstock of Carbon Black for the production of Carbon Black, nor are they added to the production process. Therefore the following substances are not expected to be contained:

- Acrylamide
- Allergens (EU Directive 2003/89/EC + 1169/2011)
- Animal and Plant origins (EMEA/410/01)
- Asbestos
- Azo compounds, aromatic amines and dyes, melamine (EU Directive 2002/61/EC)
- BADGE, BFDGE, and NOGE (EU Directive 2002/16/EC)
- Benzophenone derivatives
- BHT and BHA
- Bisphenol A
- Chlorofluorocarbons, halogenated aromatic and aliphatic compounds, including PCBs, PCTs, PFOS, PFOA, PBBs, PBDs
- Conflict Minerals (tin, tungsten and gold outlined in section 1502 of the Dodd-Frank Act
- Endangered Species of Wild Fauna and Flora or the IUCN Red List of Threathened Species
- Bovine materials or any materials associated with the development of Bovine spongiform Encephalopathy (BSE) or Creuzfeldt Jakobs Disease (CJD)
- Endocrine disrupters
- Formaldehyde
- Furans and dioxins
- Genetically modified (GMO) products or materials
- Glycol ethers
- Heavy metals (<10 ppm for each metal: As, Cd, Co, Cu, Cr, Hg, Ni, Pb, Sb, Se)
- Isopropyl thioxanthone (ITX)
- Latex
- Pesticides and biocides, including dimethyl fumarate
- Persistent organic pollutants (POPs)
- Phenols
- Phthalates and phthalate compounds
- Organotin derivatives
- Ozone depleting substances (ODS) like CFCs and HCFCs
- Radioactive substances
- Volatile organic compounds (VOCs)

Polycyclic Aromatic Hydrocarbons (PAH)

The term polycyclic aromatic hydrocarbons (PAH) refers to a class of chemicals that occur naturally in coal, crude oil, tar and gasoline. PAH can be found in Carbon Black and consumer products. They are not added intentionally and do not perform any specific function, but are produced by the incomplete combustion of the organic substances. According to different market regulations some applications (household, tools, inks, plastics coming into contact with food and selected rubber parts) require a limited concentration of PAH. Carbon Blacks with low levels of PAH are so called P-Type grades.

Food Contact & Low PAH Regulations

We have special Carbon Blacks which are in compliance to Food-Fontact & low PAH regulations.
Compliance to regulations should be communicated on forehand at all time, to be able to offer the appropriate Carbon Black grade. Individual analysis depending on grade and application on request.

European Union

Regulation EU 10/2011
For plastics, the Regulation EU 10/2011 has harmonized the purity criteria applicable to Carbon Blacks used in plastics coming into contact with food. This means the same purity criteria and restrictions are applicable to Carbon Black in all the countries of the European Union.

The purity requirements and specifications for compliance are:

- Toluene extract <0.1%* (according to ISO 6209)
- Cyclohexane extinction at 386 nm <0.02 for 1 cm cell or <0.1 for 5 cm cell using the German BfR method
- Benzo(a)pyrene <0.25 mg/kg (250 ppb)
- Primary particles of 10-300nm, aggregates of 100-1200nm, agglomerates 300nm+
- In the final food contact item, a maximum of 2.5% Carbon Black by weight is allowed

Resolution AP (89) 1
Permits the use of Carbon Black as a coloring additive in plastic consumer articles coming into contact with food.
The following requirements apply:
- Toluene extractable: maximum 0.15 %,
- Metals shall not exceed certain limits (Sb: 0.05%, As: 0.01%, Ba: 0.01%, Cd: 0.01%, Cr: 0.1%, Pb: 0.01%, Hg: 0.005%, and Se: 0.01%)
- Aromatic amines shall not exceed 500 ppm. The products listed on this regulatory information meet the requirements specified by Resolution AP (89) 1. There are no EU harmonized regulations for other food contact applications such as rubber, inks, or coatings. Therefore, the applicable laws of each member state should be consulted.

Germany

BfR IX permits the use of Carbon Black as a coloring additive in plastics for consumer articles production.
The purity requirements and specifications for compliance are:
- Carbon Black meets the requirements of EU 10/2011
- Metals shall not exceed certain limits (Sb: 0.05%, As: 0.01%, Ba: 0.01%, Cd: 0.01%, Cr: 0.1%, Pb: 0.01%, Hg: 0.005%, Se: 0.01%)

BfR XIV permits the use of Carbon Black as an additive in plastic dispersions that are used in the production of coatings for food contact articles. The purity requirements and specifications for compliance are:
- Carbon Black meets the requirements of EU 10/2011

BfR XXI permits the use of Carbon Black as filler in linings, provided it meets the purity requirements specified in 82nd Communication of the Bundesgesundheitsbl. 15 (1972) 268 and does not exceed 30%.

KTW-Leitlinie
This Guideline establishes certain requirements for substances used in plastics that come in to contact with drinking water, in particular, fillers and colorants must comply with the requirements set forth in BfR IX and LII.

Elastomerleitlinie
Carbon Black is approved for use as filler in elastomers in contact with drinking water, provided that it complies with the following requirements: metals and metalloids content:
- Pb ≤ 0.01%,
- As ≤ 0.01%,
- Hg ≤ 0.0005%,
- Cd ≤ 0.01%,
- Sb ≤ 0.005%;

PAH content according to TrinkwV Ordinance 2001:
BaP ≤ 0.00001 mg/l (0.01 ppm),
$\sum$ benzo(b)fluoranthene, benzo(j)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene ≤ 0.0001 mg/l (0.1 ppm);
purity requirements in accordance with BfR XXI.

France

Séance du 7 novembre 1995
By the decision of the Supreme Council of Public Health of France on the results of the meeting of November 7, 1995, Carbon Black is approved for use in inks and varnishes to be printed on packaging intended for contact with foodstuffs provided that it complies with the following restrictions:
The content of metals and metalloids soluble in 0.1 M HCl:
- Sb ≤ 0.05%;
- As ≤ 0.01%;
- Ba ≤ 0.05%;

• Cd ≤ 0.01%;
• Cr ≤ 0.1%;
• Pb ≤ 0.01%;
• Hg ≤ 0,005%;
• Se ≤ 0.01%;

Content of substances extractable with toluene: not more than 0.15%
BaP content should not exceed 30 µg / kg.

Arrêté du 9 novembre1994
By this decree, Carbon Black is authorized for use as additive in production of plastic materials and products in contact with foodstuffs, provided that it complies with the following requirements:
Content of metals and metalloids soluble in 0.1 M HCl:
• Pb < 0.01%;
• As < 0.01%;
• Hg < 0.005%,
• Cd < 0.01%;
• Cr < 0.1%;
• Se < 0.01%;
• Ba < 0.01%.
Content of substances extractable with toluene: not more than 0.15%.
UV-Absorption of cyclohexane extract at 386nm: <0.02 AU for for a 1 cm cell.
SML benzo (a) pyrene from finished products using Carbon Black as a filler should not exceed the detection limit of the analytical method used (LD = 0.05 µg/kg).

The maximum content of Carbon Black in the product should not exceed 50% w/w, for products in contact with milk or fats-not more than 30% w/w.

Arrêté du 25 novembre 1992
By this decree Carbon Black is authorized for use as additive in production of silicone elastomeric materials and products in contact with foodstuffs provided that it complies with the following requirements:

• Content of substances extractablewith toluene: not more than 0.15%.
• BaP content should not exceed 30 µg/kg.

Australia AS 2070 —1999

Colorants used in the manufacture of plastic materials and products must comply with the requirements of the Resolution AP(89)1.

China GB9695-208

China has adopted the following criteria:
• Toluene extract <0.1%
• Benzo(a)pyrene <0 .25 mg/kg (250 ppb)

In the final food contact item, a maximum percentage of Carbon Black by weight is allowed, depending of the type of polymer:
• In PMMA, PVC, PVDC, PU, UP, PF, PEI, PPE, PBT, PPS, POM & LCP: max. 2.5%
• In PE: max. 3%
• In PP, PS, AS, ABS, PA, PET and PC: dosage as necessary

Japan

Each product must be specifically approved by the Japan Hygienic Olefin and Styrene Plastics Association (JHOSPA).
Japan has adopted the following purity criteria:
• Toluene extract <0.1%
• Benzo(a)pyrene <0.25 mg/kg (250 ppb)

Switzerland SR 817.023.21

Switzerland has adopted the following purity criteria:
• Toluene extract <0.1%
• Cyclohexane extinction at 386 nm <0.02 for 1 cm cell or <0.1 for 5 cm cell
• Benzo(a)pyrene <0.25 mg/kg (250 ppb)
• In the final food contact item, a maximum of 2.5 % Carbon Black by weight is allowed

United States

FDA has regulatory oversight for color additives used in foods, drugs, cosmetics, and medical devices. FDA lists new color additives or new uses for listed color additives that have been shown to be safe for their intended uses in the Code of Federal Regulations (CFR).

- 21 CFR 177.2400(b)(4) - Perfluorocarbon cured elastomers
  (Restrictions: Not to exceed 15 parts per 100 parts of the terpolymer)
- 21 CFR 177.2600(c)(4)(v) - Rubber articles intended for repeated use – Fillers (Restrictions:
  Total Carbon Black not to exceed 50% by weight of rubber product; furnace combustion black content not to exceed 10% by weight of rubber products intended for use in contact with milk or edible oils.)
- 21 CFR 178.3297 - High-purity furnace black is cleared for use as colorant for polymers to be used in food contact products. Provided restrictions on PAH content and Carbon Black percentage in polymerare observed. Limitations: Total polynucleararomatic hydrocarbons not to exceed 0.5 parts per million, and benzo[a]pyrene not to exceed 5.0 parts per billion. For use at levels not to exceed 2.5 percent by weight of the polymer.

Medical use status

Carbon Black is not approved for medical applications. It cannot be used in the manufacture of pharmaceuticals or food colors.

Pharmaceutical packaging
Carbon Black is not mentioned on any of the positive lists of European Pharmacopeia Section 3.1 (Materials Used for Manufacture of Containers). Therefore, Carbon Black cannot be used in pharmaceutical packaging.

Cosmetic and tatoo ink applications
PentaCarbon GmbH does not find any justification for product use in any cosmetic applications or pigment for tattoo inks.

PAH & Heavy metals regulations for finished consumer products

The following directives and regulations apply to the finished consumer products instead of the raw material Carbon Black:

- Ende-of-life vehicles
  - o EU Directive 2000/53/EC, modified by Commission Decision 2002/52/EC
  - o Vehicles (Korean RoHs), Korea

- Extender oils and tyres
  - o European Directive 2005/69/EC

- Curred rubber product
  - o EU Directive 1272/2016 (EU8)

- Global automotive parts
  - o Global Automotive Declarable Substances List (GADSL)

- Packaging and packaging waste
  - o EU Directive 94/62/EC
  - o US Coalition of North-Eastern Governors (CONEG)

- Electrical & Electronic equipment
  - o EU Directive 2011/65/EU
  - o Act for Resource Recycling of Electrical and Electronic Equipment and Vehicles (Korean RoHs), Korea; standards Gb7T 26572
  - o China; JIS C 0950
  - o Japan CNS 15663
  - o Taiwan Regulation on Control over electronic equipment waste dd May 22 2012
  - o Turkey -Turkish RoHs

- Technical & consumer products
  - o GS-Spezifikation (Geprüfte Sicherheit) AfPS GS 2014:01 PAK

- Toy norms
  - o European Toy Standard EN 71-3 + EN 79-9
  - o EU 2009/48/EC
  - o ASTM F 963 - Standard Consumer Safety Specification for Toy Safety
  - o Mercosur Standard NM 300-2:2002 – Safety of Toys, Part 3: Migration of Certain Elements
  - o US Directive 2009/48
  - o EU Regulations No. 29847

o Turkey SOR/2011-17
o Canada

- US Consumer Product Safety Improvement Act of 2008

Heavy metals

Heavy metals are not intentionally added to Carbon Black products during the production and handling process. PentaCarbon GmbH therefore does not routinely analyze for these substances, however based on experience and analytical data of several Carbon Black products, we can confirm that Carbon Black products do not contain the below listed substances at concentrations greater than the threshold levels:

- 0.1% by weight – lead, mercury, hexavalent chromium, polybrominated biphenyls (PBBs), and polybrominated diphenyl ethers (PDBEs including Decabromodiphenyl ether Deca-BDE)
- 0.01% by weight – cadmium
- 0.1% by weight in homogenous materials for each of the following phthalates: bis(2-ethylhexyl)phthalate (DEHP), butyl benzyl phthalate (BBP), dibutyl phthalate (DBP) and diisobutyl phthalate (DIBP)

Hazardous substances

Content of hazardous substances that are subject to US Federal Regulations
Carbon Black does not contain:
- Any components covered by TSCA 12(b) Export Notification;
- Any components listed in Clean Air Act Amendments of 1990 (CAA, Section 112, 40 CFR 82) as Hazardous Air Pollutant, Flammable Substance, Toxic Substance or Class 1 or 2 Ozone Depletor;
- Any Priority Pollutants listed in Clean Water Act (CWA, 40 CFR 116); 7
- Hazardous Substances listed in The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 40 CFR 302);
- Extremely Hazardous Substances listed in Section 302 of Superfund Amendments and Reauthorization Act (SARA), Title III.

Hazard classifications

International Agency for Research and Cancer (IARC)
International Agency for Research on Cancer (IARC) has classified Carbon Black in Group 2B (may cause cancer in humans). The IARC classification is based on sufficient evidence in animals and inadequate evidence based on human health studies. However, it has been demonstrated with seasonable scientific certainty, that specific mechanism of tumor induction by Carbon Black in animals (specifically, rats) is not relevant to humans. We continue to believe that Carbon Black does not present a health hazard when handled in accordance with good housekeeping and safe workplace procedures.

European Union
Carbon Black is not classified as a hazardous substance according to Regulation (EC) No. 1272/2008 on Classification, Labeling, and Packaging of Hazardous Substances (CLP).

United Nations Globally Harmonized System of Classification and Labelling (UN GHS)
According to the UN GHS, Carbon Black is not classified as hazardous for any endpoints.

United States
29 CFR 1910.1200

Carbon Black is classified as hazardous, as a combustible dust, by the United States 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

California Proposition 65 Regulation
Carbon Black is subject to this regulation only if it is airborne, unbound particles of respirable size.

California Proposition 65 „Carbon Black (airborne, unbound particles of respirable size)“ is a California Proposition 65 listed substance. NOTE: all three listing qualifiers (airborne, unbound, and respirable size) must be met for this substance to be considered a Proposition 65 substance.
Certain polycyclic aromatic hydrocarbons (PAHs), including but not limited to benzo(a)pyrene and benzo(k)fluoranthene, may be found adsorbed onto the surface of Carbon Black and are California Proposition 65 listed substances.
Certain metals, including arsenic, cadmium, lead, mercury, and nickel, may be found adsorbed onto the surface of Carbon Black and are California Proposition 65 listed substances.“Carbon Black extracts” is a California Proposition 65 listed substance.

Massachusetts Right-to-Know Substances List: Carbon Black is listed
Pennsylvania Right-to-Know Substances List: Carbon Black is listed

New Jersey Right-to-Know Substances List: Carbon Black is listed
Lousiana Right-To-Know
The Louisiana Law Right to Know legislation requires inventory reporting through Community Right-to-Know when Carbon Black is present on-site in amount exceeding 500 pounds on any given day. Spills or releases beyond the site of the facility of greater than 5000 pounds are required to be immediately reported to the state Emergency Response Commission via Office of the State Police, Transportation and Environmental Safety Section, Hazardous material Hotline.

SARA Section 313 (40 CFR 372) Toxics Release Inventory (TRI)
Since Carbon Black contains traces of Polycyclic Aromatic Compounds (PACs) the consumers are advised to evaluate their own responsibilities for TRI reporting to Environmental Protection Agency (EPA) and State Emergency Response Commission (SERC).

SARA Sections 311/312 (40 CFR 370) Hazard Category
Chronic/Delayed Health Hazard, Fire Hazard Reporting may be required if the material is present at any time in amounts equal to or greater than 10000 pounds.

Canada
WHMIS (2015) classification: Carbon Black is considered hazardous substance (combustible dust). Carbon Black is not classified for any toxicological or eco-toxicological endpoint.

China
Regulations on Safe Management of Hazardous Chemicals (2011) – State Council Decree 591of March 11, 2011: Carbon Black is not listed in the Catalog of Hazardous Chemicals 2015.

Japan
Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture (otherwise referred to as Chemical Substances Control Law CSCL) as amended in 2017 regulates the following categories of substances that pose or suspected to pose risk for human health and/or environment:
- Class I Specified Substances
- Class II Specified Substances
- Monitoring Chemical Substances
- Priority Assessment Chemical Substances
- Specified General Chemical Substances
- Carbon Black is not designated for any of these categories.

Article 57-2 of the Japan
Industrial Safety and Health Law (ISHL) and Article 18-2 of the Enforcement Order determine certain substances, for which an SDS and mandatory labelling shall be produced in case of their presence in concentrations above established cut-off values. Carbon Black is regulated as a chemical substanc erequiring an SDS (with cut-off value > 0.1% w/w) and labelling (with cut-off value > 1% w/w) as it is specified as No. 130 (Carbon Black) in Article 18-2, Appended Table 9 of the Enforcement Order following Article 57-2 of ISHL.

Turkey
According to the criteria and requirements set forth in the Regulation on classification, labelling and packaging of hazardous substances and mixtures published in the Turkey Official Gazette under No. 28848 on December 11, 2013 (otherwise referred to as SEA Regulation), Carbon Black is not classified as hazardous substance.

Transport

Commercial Carbon Black is not classified as a hazardous material by the following agencies:

- U.N. Recommendations on the Transport of Dangerous Goods
- European Transport of Dangerous Goods Regulations by RAIL – RID, by Road – ADR or on the Rhine – ADNR
- Regulations concerning the International Carriage of Dangerous Goods by Rail (RID), part of the Convention concerning International Carriage by Rail
- European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (AND)
- International Convention for the Safety of Life at Sea — International Maritime Dangerous Goods Code (IMDG Code)
- Convention on International Civil Aviation — Annex 18 — Safe Transport of Dangerous Goods by Air
- Canadian Transport of Dangerous Goods Regulations (TDG)
- International Air Transport Association (IATA-DGR) United Nations (no UN Number)
- MARPOL 73/78, Annex II
- IBC-Code
- United States Department of Transportation (DOT, GGVS, GGVE)
- Canadian Transport of Dangerous Goods Regulation (TDG)
- Australian Dangerous Goods Code
- Brazilian Ministry of Transport – GEIPOT

UN number:	none
UN proper shipping name:	none

Transport hazard class(es):	none
Packing troup:	none
Environmental hazards:	none
Special precautions for user:	none
Transport in bulk according to Annex II of Marpol73/78 and the IBC code:	none

Self-heating

Carbon Black has been tested in accordance with the U.N. method, Self-Heating Solids, and found to be “Not a self-heating substance of Division 4.2.” In addition, Carbon Black has been tested in accordance with the U.N. method, Readily Combustible Solids, and found to be “Not a readily combustible solid of Division 4.1,” under current U.N. Recommendations on the Transport of Dangerous Goods.

Fire hazard

Carbon Blacks in fluffy powder or pellet form are combustible as they burn slowly (smolder) and sustain combustion that may not be visible as flames or smoke. In the event of a fire, note that direct water spray or stream may spread the fire due to smoldering Carbon Black powder floating on the water. A fog spray is recommended when water is used as an extinguishing agent. Also, foam is an acceptable extinguishing agent. Nitrogen or CO2 gases can be used as an extinguishing agent for smoldering Carbon Black in silos or confined areas. Carbon Black that has been on fire (or suspected of being on fire) should be observed for at least 48 hours to ensure that smoldering has ceased. Combustion gases generated during smoldering include carbon monoxide (CO), carbon dioxide (CO2), and oxides of sulfur.

Combustible/ Explosible dust hazard

According to the various international test methods (e.g. ASTM 1226, EN 14034, VDI 2263), Carbon Black is an explosible dust under laboratory test conditions (Hazard Class ST-1, weak explosion). All explosible dusts are combustible; however, not all ombustible dusts are explosible. Carbon Black is both combustible and explosible.
The minimum explosible concentration (MEC) for Carbon Black dusts suspended in air is >50g/m³. This concentration is much greater than current occupational exposure limits.

A main difference between Carbon Black and other explosible dusts is the high ignition energy of Carbon Black which is necessary to initiate a dust explosion. The dust of most Carbon Blacks suspended in air in sufficient quantities (>50g/m3) have a minimum ignition energy (MIE) greater than >1kJ according to international test methods (e.g., ASTM 2019, EN 13821, VDI 2263).

The MEC and the MIE are dependent on particle size and moisture content. These parameters may vary when Carbon Black is mixed with other substances, especially if the substance Carbon Black is being mixed with is combustible or flammable. Therefore, testing of the specific mixture is recommended to determine the explosibility parameters.

Smoldering Carbon Black can release carbon monoxide (CO), which when combined with Carbon Black can form explosible mixtures with air. Depending on the composition of the hybrid mixture (CO/Carbon Black), explosibility parameters (e.g., lower flammable limit, MEC, and MIE) may change.

Carbon Black dust may contribute to secondary dust explosions (the blast waves of a small primary explosion create a Carbon Black dust cloud which is then ignited by the primary explosion).
Good engineering practices, good housekeeping practices, and effective dust removal systems are necessary to minimize Carbon Black emissions and the resultant build-up on horizontal and some vertical surfaces.
Fugitive Carbon Black emissions should be minimized and housekeeping activities performed periodically (see NFPA 654, Table A.6.7).

Storage and handling

Carbon Black should be stored in a clean, dry, uncontaminated area away from exposure to high temperatures, open flame sources, and strong oxidizers (e.g., chlorates, bromates, liquid or compressed oxygen,and nitrates). Since Carbon Black adsorbs moisture and chemical vapors, it should be stored in closed containers.

Housekeeping and safe work practices

Spill clean-up and general housekeeping are very important for controlling Carbon Black exposures. Carbon Black dust spreads easily in air through virtually any air current or movement. Additionally, Carbon Black may stain exposed surfaces. House keeping procedures that avoid the production of dust or generation of fugitive emissions in the process are highly recommended. Dry vacuuming, with appropriate filtration, is the preferred method for removing surface dust and cleaning

spills. Dry sweeping or use of compressed air should be avoided. Bulk Carbon Black should always be covered or contained. Care should be taken to avoid generating conditions that may result in unnecessary exposure.
Carbon Black dust may penetrate electrical boxes and other electrical devices, possibly creating electrical hazards resulting in equipment failure. Electrical devices that may be exposed to Carbon Black dust should be tightly sealed or purged with clean air, periodically inspected, and cleaned, as required. Some grades of Carbon Black may be less electrically conductive, permitting a build-up of static energy during handling. Grounding of equipment and conveying systems may be required under certain conditions.

Safe work practices include the elimination of potential ignition sources in proximity to Carbon Black dust, good housekeeping to avoid accumulations of dust on all surfaces, appropriate exhaust ventilation design and maintenance to control airborne dust levels to below the applicable occupational exposure limit, avoidance of dry sweeping or pressurized air for cleanup, avoidance of the use of Carbon Black with incompatible materials (e.g. chlorates and nitrates), and appropriate employee hazard training.

Acute first aid

There is no evidence to suggest that acute exposure to Carbon Black may result in life threatening injury or illness. Ingestion is an unlikely method of accidental exposure. Carbon Black does not produce respiratory or dermal sensitization. Like many dusts, inhalation of Carbon Black may initiate a bronchial response among individuals with pre-existing lung conditions.

Inhalation
Short-term exposures to elevated concentrations may produce temporary discomfort to the upper respiratory tract, which may result in coughing and wheezing. Removal from Carbon Black exposure is normally sufficient to cause symptoms to subside without lasting effects.

Skin
Carbon Black dust or powder may cause drying of the skin with repeated and prolonged contact. Skin drying may also result from frequent washing of Carbon Black contaminated skin. Carbon Black may be washed from the skin using mild soap and water along with gentle scrubbing action. Repeat washing may be necessary to remove Carbon Black. A protective barrier cream on exposed skin surfaces may also be an effective method for minimizing dermal exposure.

Ingestion
No adverse effects are expected from Carbon Black ingestion. Do not induce vomiting.

Eye
Carbon Black is not a chemical irritant. Treat symptomatically for mechanical irritation. Rinse eyes thoroughly with water to remove dust. If irritation persists or symptoms develop, seek medical attention.

Toxicological Information
See Material Safety Data Sheet

For independent safety, health & environmental information on the use of Carbon Black, please consult the Carbon Black User's Guide or Protection against Dust Explosion Manual of the International Carbon Black Association. Additional information can be found in our Material Safety Data Sheet and in our section downloads on our website www.pentacarbon.de.