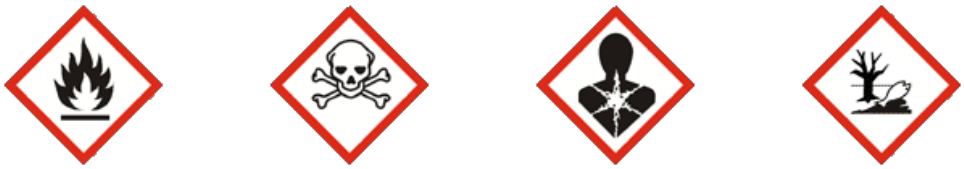
IFA
Institut für Arbeitsschutz der
Deutschen Gesetzlichen Unfallversicherung

Cobalt, powder



Identification | Characterisation | Formula | Physical and chemical properties | Toxicology / Ecotoxicology | Occupational health and first aid | Safe handling | Regulations | Links | Literature register

IDENTIFICATION

Cobalt, powder

ZVG No:	7270
CAS No:	7440-48-4
EC No:	231-158-0
INDEX No:	027-001-00-9

CHARACTERISATION

SUBSTANCE GROUP CODE

134000 Metals

STATE OF AGGREGATION

The substance is solid.

PROPERTIES

metal powder
dark grey
odourless

CHEMICAL CHARACTERISATION

Flammable solid.
Can be ignited by the brief effects of exposure to sources of ignition and continues to burn when these are no longer present. The risk of ignition is greater the more finely the substance is spread.
Non-passivated cobalt metal powder can also ignite itself.
The metal is non-flammable in compact form.
Practically insoluble in water.
Acute or chronic health hazards result from the substance.
The substance is hazardous to the aquatic environment.
(see: chapter REGULATIONS).

Substance information in Wikipedia

DUST EXPLOSIVENESS

There is a risk of a dust explosion if the following conditions are met:
- The substance is given in very finely distributed form (powder, dust).
- The substance is whirled up in sufficient quantity in the air.
- An ignition source is present (flame, spark, electrostatic discharge, etc.)

Quelle: 06806

FORMULA

Co

Molar mass: 58,93 g/mol

PHYSICAL AND CHEMICAL PROPERTIES

Melting point | Boiling point | Density | Solubility | Hazardous reactions

MELTING POINT

Melting point: 1495 °C

Reference: 00305 00454 02085

BOILING POINT

Boiling Point: 2927 °C

Reference: 00454 01251 07520

DENSITY

DENSITY

Value: 8,92 g/cm³

Temperature: 20 °C

Reference: 00132 00419 01251

SOLUBILITY IN WATER

practically insoluble in water

Temperature: 20 °C

Reference: 00419 01211 01251

HAZARDOUS REACTIONS

Thermal decomposition
Self-ignition possible.

Hazardous chemical reactions

Risk of explosion in contact with:
hydrogen peroxide
acetylene (cobalt dust)
ammonium nitrate (heat)
hydrazine nitrate

The substance can react dangerously with:
strong oxidizing agents
bromine pentafluoride (rarely)
air (cobalt dust)
nitryl fluoride

TOXICOLOGY / ECOTOXICOLOGY

TOXICOLOGICAL DATA

LD50 oral rat

Value: 6171 mg/kg

ATDAEI Acute Toxicity Data. Journal of the American College of Toxicology, Part B. (Mary Ann Liebert, Inc., 1651 Third Ave., New York, NY 10128) Vol. 1, Pg. 686, 1992. (RTECS)

Reference: 00438

OCCUPATIONAL HEALTH AND FIRST AID

Routes of exposure | Toxic effects | First Aid |
Occupational health check

ROUTES OF EXPOSURE

Main routes of exposure

During occupational handling, metallic cobalt (Co) is mainly taken in via the respiratory tract.[07619]

Respiratory tract

Studies on persons exposed to Co metal dust (maximum Co elimination in the urine shortly after the end of exposure) indicate an effective absorption.[99996]
In animal experiments, particle size and certain additional noxa demonstrated a modifying effect.[99983]
In experiments on rats, ultrafine particles of metallic Co (20 nm) dissolved in the lung during a few hours, larger particles (11 µm) had a half life of a few days.[07619]
Combined exposure of rats to the hard metal constituent tungsten carbide led to an increased absorption velocity and pulmonary absorption rate for Co.[99996]

Skin

Absorption of metallic Co through the skin was experimentally demonstrable on persons occupationally exposed and on volunteers. The level varying considerably from individual to individual. In comparison to the inhalative intake of Co, uptake through the skin is generally not considered to be significant.[99996]

Gastrointestinal tract

When exposed to dust, partial transfer into the gastrointestinal tract as a consequence of the mucociliary clearance mechanism of the respiratory tract or by means of direct oral intake (in cases of insufficient hygiene) can take place.
Data on absorption rates for Co compounds vary.[99996]
Very low doses are thought to be absorbed almost completely, high doses only to a low degree.[07866]
No specific data is available on metallic Co.[99983]

TOXIC EFFECTS

Main toxic effects

Acute:
Sensitizing action to the skin and airways[07619]
Chronic:
Allergic or irritative reactions of the airways, damage to the lung (fibrosis), allergic skin disease[99996]

Acute toxicity

Little data is available on the acute effects on metallic Co.[99983]
Based on occupational experience, very general indications exist of possible eye irritation but not of skin irritation.[07636]
No confirming case reports or results of standardized animal experimental tests are available on this issue.[00220]
The validity of an experiment on rabbits' eyes in which instillation of Co metal powder caused formation of abscess to the lens, retina, ciliary and vitreous body is not assessable because of an insufficient documentation of the experiment.[07979]
Skin sensitizing action of Co compounds and also metallic Co is definitely confirmed both by animal experiments and also by studies on skin patients. The sensitization probably requires prolonged contact (see "Chronic toxicity"). However, for sensitized persons, even very low doses can cause allergic skin reactions following renewed contact.
Co dust has been shown to act as a respiratory allergen. Persons sensitized showed both immediate bronchial reactions and also isolated late reactions as well as dual reactions in inhalative provocation tests.[07619]
Occupational experience and animal experiments additionally indicate primary irritation of Co dust to the respiratory tract.[99996]
Healthy persons acutely exposed to hard metal dust containing Co at a concentration of 0.038 mg Co/m3 showed acute reversible effects (irritation to the airways, reduced vital capacity). 6 hours after intratracheal instillation of 1 mg Co metal dust into rats' they showed serious lung damage (inflammation of the bronchioles, formation of edema) which, however, healed later. In an inhalative tests on rats, exposure to 10 g Co/m3 for 1 hour did not cause death.
Only a few data are available on systemic effects due to metal dust from animal experiments.[07619]
Following oral application of high doses to rats, relatively unspecific symptoms (somnolence, ataxia, diarrhoea) were observed at the lethal level (LD50 6171 mg/kg bw).[00450]

Chronic toxicity

Experience of occupational handling mainly results from studies on working areas with mixed exposures: in particular for the production, processing and use of hard metals (combined exposure with tungsten carbide) as well as for the grinding of diamonds with cobalt-containing disks (mixed exposure to particles of iron and diamond).
Monofactorial exposure to Co metal dust only occurs in the production of Co powder. Despite the difficulties in assigning observed effects, the respiratory tract was shown to be the main target organ of effects caused by Co in numerous studies. In this connection, damage of different kinds appeared.
Inflammation in the nose/throat area were mainly observed for hard metal workers. This was attributed to an nonspecific irritation by Co-containing particles or an immunological reaction (allergic rhinitis).
A small proportion of persons exposed to Co (both pure grade Co powder and also hard metal dust) suffered from a typical bronchial asthma. Co was determined to be the initiating agent by detection of specific IgE antibodies and positive provocation tests with Co powder or Co salts. Continuous exposure to dust containing Co can even lead to the development of an obstructive syndrome (reduction of FEV) which is possibly caused by irritation. In particular, pathological changes in the lung parenchyma were frequently reported. They mostly occurred following exposure to hard metal dust and were referred to as "hard metal disease" or "hard metal lung". They include inflammatory changes (subacute to chronic alveolitis) through to unspecific lung fibrosis with decreased dilatability and elasticity of the lung as well as restriction of the lung function (restrictive syndrome). In terminal case, heart damage (cor pulmonale) or cardiac/respiratory arrest can cause death. Only a minor percentage of the employees exposed develop a lung fibrosis. Therefore, it is assumed that individual sensitivity is a determinant.[99996]
Analogous inflammatory and fibrotic lung changes have repeatedly been found also for grinders of diamonds.[07748]
In comparison, no similar cases were reported from the production process of Co powder (monofactorial exposure to Co), although there were comparable high exposures. The findings indicate that additional noxae, especially tungsten carbide in the case of exposure to hard metals, are very important for the development of the disease. This assumption is supported by results from animal experiments. Following intratracheal application of mixtures of Co with tungsten carbide, they showed distinctly stronger inflammatory and fibrotic reactions than for equivalent doses of Co powder alone.
Besides disease of the airways, allergic skin damage (formation of eczema, urticaria) is considered probably to be a consequence of exposure to Co. It was found both for persons occupationally exposed and also extraprofessionally (as a consequence of handling detergents containing Co).
In most cases there is a combined allergy also to nickel and/or chromium, seldom an isolated Co allergy. In the literature there are different views as to whether this finding is to be assessed as cross allergy or as a consequence of the frequently combined exposure or as stimulation of the Co allergy by the preinjured skin due to eczema. Apparently, systemic effects following exposure to Co metal are less significant.[99996]
Damage to the heart muscle in connection with exposures to Co dust was reported in isolated cases only.[07748]
In general, a damaging effect to the heart has become known from cases of poisoning with Co compounds. They occurred following prolonged, sometimes massive drinking of beer containing Co sulfate (serious, sometimes fatal cardiomyopathy). However, a synergistic action due to protein deficiency and alcohol intake is likely. In one single case, continuous loss of hearing and optic nerve atrophy was attributed to exposure to Co powder for 20 months. After the end of exposure partial improvement occurred.
Based on experience of the earlier use of Co salts as medicaments it is assumed that changes in the hemogram (polycythemia) and hypofunction of the thyroid gland can also occur under occupational exposure.[99996]
There are also indications of an influence on the thyroid function due to inhalative exposure from a test on rats exposed to Co metal dust for several months.[07619]

Reproductive toxicity, mutagenicity, carcinogenicity

For classifying the reproductive toxicity and mutagenic and carcinogenic potential see list in Annex VI of the CLP regulation / TRGS 905 / List of MAK values (see section REGULATIONS).
Reproductive toxicity:
Insufficient data is available on metallic Co.[99983]
Mutagenicity:
An impairment of genetic material of germ cells has either been demonstrated or shown to be probable in appropriate investigations.
[07619]
Mutagenicity tests with Co and its compounds, however, allow the conclusion to be drawn that the mutagenic action is weak.[05323]
The in-vitro clastogenic effect of Co dust is increased by tungsten carbide; on the other hand, Co dust increased the genotoxic action of mutagenic agents.
Carcinogenicity:
For Co in the form of respirable dust/aerosols:
From the available information material it was concluded that the substance should be considered as carcinogenic for humans.
In inhalation studies with Co sulfate on rodents its carcinogenic action was determined. In mechanistic studies, the Co ion was identified to be the effective agent.
Metallic Co is also considered as bioavailable so that the release of Co ions is to be expected.
[07619]
However, other expert groups do not yet consider the data base for metallic Co to be sufficient to assess the carcinogenic potential for humans.[05323]

Biotransformation and excretion

Co is an essential trace element for humans.
Daily doses between 40 and 50 µg Co are taken in with the food. The adult body contains about 1 mg Co on average and the largest amount is accumulated in the liver, kidneys, heart and muscle.
Following unintentional oral intake of radioactive Co a multiphase elimination with half lives of 0.5; 27 and 59 days was estimated.
The rapid disposal of metallic Co from the lung which was observed following inhalative exposure is attributed to the effective solubility in biological fluids.[07620]
This also explains that following occupational exposure to Co metal dust the Co contents in the blood and urine showed a kinetic like that of highly soluble Co salts.[99996]
In the blood, Co is bound to plasma proteins (mainly albumines and globulines) and on hemoglobin or erythrocytes.[07620]
The elimination from the organism mainly proceeds via the urine and feces. Only very minor amounts were found in sweat, mother's milk and hair.
The elimination with the urine was shown to proceed in 2 phases. The largest part is eliminated within a few days, a residue very long-term (during years). Co contents in the blood and urine are closely related to the exposure to Co dust and enable estimation of the previous exposure. The concentration representing a risk, however, cannot be determined.[99996]
The formation of radical oxygen species is probably significant for the toxic action. For instance, they were detectable for hard metal dust by interaction of Co, tungsten carbide and oxygen.[07619]

Annotation

This occupational health information was compiled on 01.09.2003.
It will be updated if necessary.

FIRST AID

Eyes

Rinse the affected eye with widely spread lids for 10 minutes under running water whilst protecting the unimpaired eye.
Arrange medical treatment.
[00330]

Skin

Remove contaminated clothing while protecting yourself.
Cleanse the affected skin areas thoroughly with soap under running water.
Following massive skin contact or if irritation appears:
Arrange for medical treatment.
[00330]

Respiratory tract

Whilst protecting yourself remove the casualty from the hazardous area and take him to the fresh air.
Lay the casualty down in a quiet place and protect him against hypothermia.
Arrange medical treatment.
If there are signs of irritation or difficulties in breathing:
As soon as possible repeatedly have the casualty deeply breath a glucocorticoid inhalation spray in.
[00022]

Swallowing

Rinse the mouth and spit the fluids out.
If the casualty is conscious have him drink 1 glass of water (ca 200 ml).
Call a physician to the site of the accident.
If vomiting occurs, hold the head of the casualty low with the body in a prone position in order to avoid aspiration.
[00022, 99999]

Information for physicians

According to available experience and animal experiments, the danger of poisoning following exposure to Co metal is low. An acute risk is more probable for sensitized persons due to allergic reactions of the airways. Even if there are no symptoms, a thorough decontamination should take place because of possible long-term effects.[99983]

- Symptoms of acute poisoning:
Eyes: irritation (possibly mechanically conditioned in some cases),[07636] following prolonged contact possibly distinct damage[07979]
Skin: irritation probably only mechanical;[00220] allergic reactions (urticarial exanthema or erythematouspapular efflorescents) possible;[07636] acute absorptive-toxic effects not to be expected[00220]
Inhalation: concentration-dependent irritation in the nosopharyngeal area, disturbance of the respiratory function, bronchoconstriction; for sensitized persons allergic airway reactions as a result of even low exposure (bronchial asthma); following massive exposure lung damage not to be excluded (possibly only as a delayed effect)[07619]
Ingestion: probable gastrointestinal symptoms;[08013] following high dose even absorptive-toxic effects possible[07619]
Absorption: in general for Co/Co compounds more probable central nervous and vasoactive effects (paralysis of the vessel muscles); disturbance of the heart function and delayed damage to the heart not to be excluded.[08013]

- Medical advice:
Particles in the eye are to be removed by persistent rinsing or by a cotton bud as necessary. In all cases, further treatment by an ophthalmologist is definitely indicated.
Carefully cleanse contaminated skin, in particular watch for wounds, skin chaps and covered (hidden) areas. Irritated areas can be treated with a dermatocorticoid.[99999]
Following massive inhalation immediately provide fresh air and lay the casualty down in a quiet place.[00022]
One can try to support the self-cleaning process of the lung by application of expectorants.[99999]
For irritation or difficulties in breathing immediately apply glucocorticoids (inhalatively, intravenously).[00022]
Following massive exposure, in addition to application of glucocorticoids initiate all further prophylactic measures for lung edema, later even prophylaxis for pneumonia and long-term postobservation.
Following swallowing it is recommended to administer liquid and carrry out gastroscopic examination. Drawing off of the stomach content or gastrolavage is to be considered. It seems to be favorable to take measures to ensure a rapid passage through the bowels (application of a salinic laxative and probably also of gruel and roughage). Treat systemic effects symptomatically as necessary.[08013]
For a differential diagnosis of the poisoning hospitalize the casualty.[99999]
Checking the water-electrolyte balance, kidney function and ECG are in particular recommended.
The effectiveness of antidotes (like DMPS, CaNa2-EDTA, penicillamine or sodium thiosulfate/calcium thiosulfate) is clinically not definite. Considering a possible cardiomyopathy, a careful cardiological final examination is recommended.[08013]

Recommendations

Provide the physician information about the substance/product and treatment already administered.
Some sources state that exposure to Co-fumes or metal dust can initiate metal vapor fever.[07638] However, no experience reports are available on this.[99983]

Annotation

This first aid information was compiled on 01.09.2003.
It will be updated if necessary.

OCCUPATIONAL HEALTH CHECK

Prophylaxis offer: Occupational medical prevention has to be offered when, conducting activities with this substance, repeated exposure cannot be excluded.
Subsequent prophylaxis: After termination of activities with exposure to this substance subsequent occupational medical prophylaxis has to be offered.

Deadlines: Prophylaxis offer has to be made prior to taking up work. Deadlines for the proposal of regularly recurrent occupational medical prevention and subsequent prophylaxis are to gather from the Occupational Health Rule (Arbeitsmedizinische Regel) “AMR Nummer 2.1”.

SAFE HANDLING

Handling | Storage | Fire and explosion protection | Organisational measures | Personal protection | Disposal considerations | Accidental release measures | Fire fighting measures

PRELIMINARY NOTE

For activities with the substance, further protective measures according to TRGS 561 "Activities with carcinogenic metals and their compounds" must be observed.

TECHNICAL MEASURES - HANDLING

Workplace

Work areas should be physically separated if possible.
Provision of very good ventilation in the working area.
The cleaned air should not be returned to the working area. Air that has been pumped out can only be returned if it has been sufficiently cleaned using an acknowledged method.
The floor should not have a floor drain.
Washing facility at the workplace required.

Equipment

Carcinogenic and germ cell mutagenic substances should only be used in closed apparatus. If release of the substance cannot be prevented, then it should be suctioned off at the point of exit.
Consider emission limit values, a purification of waste gases if necessary.
Label containers and pipelines clearly.

Advice on safer handling

Take care to maintain clean working place.
The substance must not be present at workplaces in quantities above that required for work to be progressed.
Do not leave container open.
Use leak-proof equipment with exhaust for refilling or transfer.
Avoid spillage.
Fill only into labelled container.
Avoid any contact when handling the substance.
Avoid rising dust.
Use an appropriate exterior vessel when transporting in fragile containers.

Cleaning and maintenance

Clean daily.
Use protective equipment while cleaning if necessary.
Avoid dust formation. Dust formation that cannot be avoided must be collected regularly.
Use tested explosion-proof industrial vacuum cleaners of class H.
Do not raise dust while cleaning.
Use of a blower for cleaning is not permitted.
A device that has become dirty may only be used in other work areas after it has been cleaned.
Only conduct maintenance and other work on or in the vessel or closed spaces after obtaining written permission.

TECHNICAL MEASURES - STORAGE

Storage

Keep in locked storage or only make accessible to specialists or their authorised assistants.
Do not use any food containers - risk of mistake.
Containers have to be labelled clearly and permanently.
Store in the original container as much as possible.
Keep container tightly closed.
Store in a dry place.

Conditions of collocated storage

Storage class 4.1 B (Flammable solid or desensitized substances)
Only substances of the same storage class should be stored together.
Collocated storage with the following substances is prohibited:
- Pharmaceuticals, foods, and animal feeds including additives.
- Infectious, radioactive und explosive substances.
- Gases.
- Aerosols (spray bottles).
- Flammable liquids of storage class 3.
- Strongly oxidizing substances of storage class 5.1A.
- Ammonium nitrate and preparations containing ammonium nitrate.

- Non combustible acutely toxic substances of storage class 6.1B.

Under certain conditions the collocated storage with the following sub-stances is permitted (For more details see TRGS 510):
- Other explosive substances of storage class 4.1A.
- Pyrophoric substances.
- Substances liberating flammable gases in contact with water.
- Oxidizing substances of storage class 5.1B.
- Organic peroxides and self reactive substances.
- Combustible acutely toxic substances.
- Noncombustible toxic or chronically acting substances of storage class 6.1D.

The substance should not be stored with substances with which ha-zardous chemical reactions are possible.

TECHNICAL MEASURES - FIRE AND EXPLOSION PROTECTION

Technical, constructive measures

The substance is combustible in a finely distributed form
(powder, dust).
Fire fighting equipment must be available.
If there is a risk of a dust explosion due to the dust-like distribution and the quantities used, measures according to TRGS 722 (prevention of formation), 723 (prevention of ignition) and TRGS 724 (constructive explosion protection) may become necessary.

Precaution on handling

Areas in which the substance can arise as a dust in such quantities that a dust explosion could occur are to be considered as at a risk of explosion.

Keep away from sources of ignition (e.g. open flames, heat sources and sparks).

ORGANISATIONAL MEASURES

Instruction on the hazards and the protective measures using instruction manual (TRGS 555) are required with signature if just more than one minor hazard was detected.

Instruction must be provided before employment and then at a minimum of once per annum thereafter.

The MAK commission's carcinogenic rating for this substance must be clearly indicated.

The concentration of the substance in the air must be

minimized.

The number of employees who work with the hazardous substance must be kept to a minimum.

Observe the restrictions on juvenile employment as defined in the "Jugendarbeitsschutzgesetz".

Observe the restrictions on activities of pregnant women according to the the „Mutterschutzgesetz“ (German Maternity Protection Act)

Only employees are permitted to enter the work areas. Signposting to this effect must be displayed.

PERSONAL PROTECTION

Body protection

Depending on the risk, wear a suitable protective clothing or a suitable chemical protection suit.

Respiratory protection

In an emergency (e.g.: unintentional release of the substance) respiratory protection must be worn. Consider the maximum period for wear.

Respiratory protection: Particle filter P3, colour code white.

Use insulating device for concentrations above the usage limits for filter devices, for oxygen concentrations below 17% volume, or in circumstances which are unclear.

Eye protection

Sufficient eye protection must be worn.

Wear glasses with side protection.

Hand protection

Use protective gloves. The glove material must be sufficiently impermeable and resistant to the substance. Check the tightness before wear. Gloves should be well cleaned before being removed, then stored in a well ventilated location. Pay attention to skin care.

Skin protection cremes do not protect sufficiently against the substance.

Textile or leather gloves are completely unsuitable.

Currently there is no information available regading suitable glove materials.

Ask the manufacturer for suitable materials.

Occupational hygiene

Foods, beverages and other articles of consumption must not be consumed at the work areas. Suitable areas are to be designated for these purposes.

Avoid contact with skin. In case of contact wash skin.

Avoid inhalation of dust.

Avoid contact with clothing. Contaminated clothes must be exchanged and cleaned carefully.

Provide washrooms with showers and if possible rooms with separate storage for street clothing and work clothing.

The skin must be washed with soap and water before breaks and at the end of work. Apply fatty skin-care products after washing.

Take care of personal hygiene.

DISPOSAL CONSIDERATIONS

Hazardous waste according to Waste Catalogue Ordinance (AVV).

If there is no way of recycling it must be disposed of in compliance with the respective national and local regulations.

Collection of small amounts of substance:
Do not put/place waste into sink or dust bin.
Residues should be recycled.
Collect in container for recyclable metal residues. All metals should be collected separately.
Collection vessels must be clearly labelled with a systematic description of their contents. Store the vessels in a well-ventilated location. Entrust them to the appropriate authorities for disposal.

ACCIDENTAL RELEASE MEASURES

Evacuate area. Warn affected surroundings.
The hazardous area may only be entered once suitable protective measures are implemented. Only then can the hazardous situation be removed (see chapter Personal Protection).
Pick up without creating dust.
Use non-sparking tools.
Afterwards ventilate area and wash spill site.

Endangerment of watert:
Severe hazard to waters. Avoid penetration into water, drainage, sewer, or the ground. Inform the responsible authorities about penetration of even small quantities.

FIRE FIGHTING MEASURES

Suitable extinguishing media
Metal fire extinguisher
Dry sand

Unsuitable extinguishing media
Water
Foam

Instructions
Seek immediate cover in case of sudden release and raising of large quantities of dust.
If possible, take container out of dangerous zone.
Shut off sources of ignition.
Do not allow runoff to get into the sewage system.

Special protective equipment
In the case of a fire hazardous substances can be released.
Metal oxide fume
Wear self-contained breathing apparatus and special tightly sealed suit.

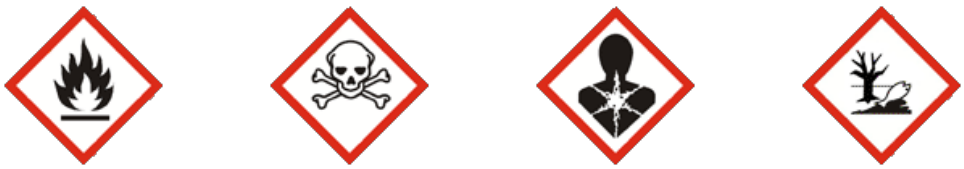
REGULATIONS

GHS Classification/Labelling | Workplace labelling | Water hazard class | Air quality control | Transport Regulations | MAK recommendations | SevesoIII | Restriction of use | Technical rules | Regulations of accident insurers | Occupational health check

EUROPEAN GHS CLASSIFICATION AND LABELLING

Classification

Flammable solids, Category 2; H228
Acute toxicity, Category 4, oral; H302
Acute toxicity, Category 1, inhalation; H330
Eye irritation, Category 2; H319
Skin sensitisation, Category 1; H317
Respiratory sensitisation, Category 1; H334
Germ cell mutagenicity, Category 2; H341
Carcinogenicity, Category 1B; H350
Reproductive toxicity, Category 1B; H360F
Hazardous to the aquatic environment, Acute Category 1; H400
Hazardous to the aquatic environment, Chronic Category 1; H410



Signal Word "Danger"

Hazard Statement - H-phrases

H228: Flammable solid.
H302: Harmful if swallowed.
H330: Fatal if inhaled.
H319: Causes serious eye irritation.
H317: May cause an allergic skin reaction.
H334: May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H341: Suspected of causing genetic defects.
H350: May cause cancer.
H360F: May damage fertility.
H410: Very toxic to aquatic life with long lasting effects.

Precautionary Statement - P-phrases

P201: Obtain special instructions before use.
P202: Do not handle until all safety precautions have been read and understood.
P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P308+P313: IF exposed or concerned: Get medical advice/attention.
P501: Dispose of contents/ container to an approved waste disposal plant.

Manufacturer's specification by Freeport Cobalt
in connection with
European GHS Classification according to regulation (EC) 1272/2008, 14. ATP

Reference: 01502 07514
State: 2018
Checked: 2020

The substance is listed in appendix VI, table 3 of CLP regulation.
The given classification can deviate from the listed classification, since this classification is to be complemented concerning missing or divergent danger classes and categories for the respective substance.

GESTIS advice:
The flammability of cobalt metal powder is highly dependent on the physical form, the production process and the particle size/surface area of the respective sample. No clear cut-off value for the particle size/flammability properties can be given. It became apparent in numerous guideline-compliant flammability tests that cobalt metal powder with a MMD/D50 above 200 µm is non-flammable.
If applicable, "H228: Flammable solid" may be omitted.

"H330: Danger of death by inhalation" is omitted for non-inhalable cobalt powder.

Reference: 07520 99999

GESTIS advice:
15 (!) different classification variants are indicated in the ECHA registration record of the colloquium consisting of 85 manufacturers. It is not clear to the user which substance variants lead to which classifications!

Reference: 99999

GHS-CLASSIFICATION OF MIXTURES

The classification of mixtures containing this substance results from Annex 1 of Regulation (EC) 1272/2008.

Special rules for supplemental label elements according to Regulation (EC) No 1272/2008 Annex II, No 2.8: The label on the packaging of mixtures containing at least one substance classified as sensitising and present in a concentration equal to or greater than 0,1 % or in a concentration equal to or greater than that specified under a specific note for the substance in part 3 of Annex VI shall bear the statement:
EUH208 - ‘Contains (name of sensitising substance). May produce an allergic reaction’

Reference: 99999

WORKPLACE LABELLING ACCORDING TO GERMAN ASR A1.3

Prohibition label

No open flame; fire, open ignition sources and smoking prohibited

No admittance for unauthorized persons

No eating and drinking

Warning label

Caution - inflammable material

Caution - toxic material

Precept label

Use safety goggles

Wear safety gloves

GERMAN WATER HAZARD CLASS

Substance No: 8026

WGK 3 - severe hazard to waters

Classification according to the announcement of the list of substances hazardous to water in the Federal Register of 10.08.2017, last update 24.11.2023
Scope: Cobalt metallic, particle size ‹ 1mm

Substance No: 7855

WGK 1 - low hazard to waters

Classification according to the announcement of the list of substances hazardous to water in the Federal Register of 10.08.2017, last update 24.11.2023
Scope: Cobalt metallic, particle size ›= 1 mm

TECHNICAL INSTRUCTIONS ON AIR QUALITY CONTROL (TA LUFT)

Chapter 5.2.2 Inorganic dusts
Class II
Also with the presence of several substances of the same class, the following values are in all not allowed to be exceeded in the exhaust gas:

Mass flow: 2,5 g/hr

or

Mass conc.: 0,5 mg/m³

Specified as Co.

TRANSPORT REGULATIONS

UN Number: 3089
Shipping name: Metal powder, flammable, n.o.s.
Hazard Identification Number: 40
Class: 4.1 (Flammable solids)
Packing Group: II (medium danger)
Danger Label: 4.1

Special labelling: Symbol (fish and tree)

Classification code: F3

Tunnel restrictions:
Passage forbidden through tunnels of category E.

Reference: 01231

RECOMMENDATIONS OF MAK-COMMISSION

This data is recommended by scientific experience and is not established law.

Risk of percutaneous absorption
Risk of sensitization of respiratory tract and skin

Carcinogenic: Category 2
These substances must be regarded as carcinogenic because according to the results of animal experiments they give rise to considerable contribution to the risk of cancer

Germ cell mutagenic: Category 3A
Substances which have been shown to induce genetic damage in germ cells of humans or animals, or which produce mutagenic effects in somatic cells of mammals in vivo and have been shown to reach the germ cells in an actve form.

scope: inhalable fraction
also apply for cobalt alloys containing bio-available cobalt

TRGS 910

Substance-specific acceptance and tolerance concentrations

Acceptance concentration

Conc. (weight):	0,5 µg/m³	Alveolar fraction

Acceptance concentration associated with risk 4:10000

Tolerance concentration

Conc. (weight):	5 µg/m³	Alveolar fraction

Excursion factor: 8

see TRGS 561

Reference: 05326

DIRECTIVE 2012/18/EU (Seveso III)

The substance is subject to the hazard categories of the Hazardous Incident Ordinance:

H1	Acute toxic Category 1, all exposure routes
E1	Hazardous to the aquatic environment, Category Acute 1 or Chronic 1

Quantity thresholds for determination of operation scopes:

Annex I Part 1 Section: E1
Hazardous to the aquatic environment
Qualifying quantity for the application of
Lower-tier requirements: 100 t
Upper-tier requirements: 200 t

Quantity thresholds for determination of operation scopes:

Annex I Part 1 Section: H1
Acute toxic
Qualifying quantity for the application of
Lower-tier requirements: 5 t
Upper-tier requirements: 20 t

RESTRICTIONS OF USE / BANS OF USE

REACH Regulation (EC) No 1907/2006 Annex XVII

Annex XVII, Point 28 and Point 29 and Point 30
The substance shall not be placed on the market or used as a substance or as a constituent of other substances or in mixtures for supply to the general public when the concentration of the substance or mixture reaches or exceeds the concentration limits according to the CLP Regulation. When placing the substance or mixture on the market for professional users, the supplier shall ensure that the packaging of such substances and mixtures is marked with the label "Restricted to professional users." For further details, please refer to the Regulation.

Annex XVII, Point 40
Shall not be used, as substance or as mixtures in aerosol dispensers
where these aerosol dispensers are intended for supply to the general
public for entertainment and decorative purposes such as the following:
— metallic glitter intended mainly for decoration,
— artificial snow and frost,
— “whoopee” cushions,
— silly string aerosols,
— imitation excrement,
— horns for parties,
— decorative flakes and foams,
— artificial cobwebs,
— stink bombs.
Further information on prohibitions and exceptions can be taken from the regulation.

Annex XVII, Point 75
Mixtures containing certain hazardous substances shall no longer be placed on the market for tattooing purposes. Mixtures containing such substances in specified concentrations shall no longer be used for tattooing purposes after 04.01.2022. Substances falling within one or more of the following points:
- carcinogenic or reproductive toxic substances according to Part 3 of Annex VI to CLP Regulation (excluding the classification due to effects only following exposure by inhalation),
- skin-sensitising, skin-corrosive, skin-irritant, serious eye-damaging or eye-irritant substances according to Annex VI Part 3 of the CLP Regulation,
- substances listed with specified conditions in Annex II or IV to Regulation (EC) No 1223/2009 [Cosmetics Regulation], and
- substances listed in Appendix 13 to Annex XVII (point 75) of the REACH Regulation.
In general, mixtures placed on the market for use for tattooing purposes must be labelled "Mixture for use in tattoos or permanent make-up." from 04.01.2022 on and may not be used for tattooing purposes without this labelling. Further safety information shall be provided on the packaging or in the instructions for use. Before using a mixture for tattooing purposes, the person using the mixture shall provide this information to the person undergoing the procedure.
Further information on the restrictions, concentration limits and exemptions can be taken from the Regulation.

Annex XVII to Regulation (EC) No 1907/2006, consolidated version (BAUA) (only in German)

TECHNICAL RULES FOR HAZARDOUS SUBSTANCES

TRGS 201
Einstufung und Kennzeichnung bei Tätigkeiten mit Gefahrstoffen; Ausgabe Februar 2017, zuletzt geändert und ergänzt April 2018

TRGS 400
Gefährdungsbeurteilung für Tätigkeiten mit Gefahrstoffen; Ausgabe Juli 2017

TRGS 555
Betriebsanweisung und Information der Beschäftigten; Ausgabe Februar 2017

TRGS 600
Substitution; Ausgabe Juli 2020

TRGS 401
Gefährdung durch Hautkontakt, Ermittlung - Beurteilung - Maßnahmen; Ausgabe Oktober 2022

TRGS 406
Sensibilisierende Stoffe für die Atemwege; Ausgabe Juni 2008, korrigiert März 2009

TRGS 410
Expositionsverzeichnis bei Gefährdung gegenüber krebserzeugenden oder keimzellmutagenen Gefahrstoffen der Kategorien 1A oder 1B; Ausgabe Juni 2015, zuletzt berichtigt Februar 2021

TRGS 500
Schutzmaßnahmen; Ausgabe September 2019

TRGS 509
Lagern von flüssigen und festen Gefahrstoffen in ortsfesten Behältern sowie Füll- und Entleerstellen für ortsbewegliche Behälter; Ausgabe Juni 2022

TRGS 510
Lagerung von Gefahrstoffen in ortsbeweglichen Behältern; Ausgabe Januar Dezember 2020

TRGS 800
Brandschutzmaßnahmen; Ausgabe Dezember 2010

TRGS 720
Gefährliche explosionsfähige Gemische - Allgemeines; Ausgabe Juli 2020, zuletzt berichtigt März 2021

TRGS 721
Gefährliche explosionsfähige Gemische - Beurteilung der Explosionsgefährdung; Ausgabe Oktober 2020, zuletzt berichtigt Dezember 2020

TRGS 722
Vermeidung oder Einschränkung gefährlicher explosionsfähiger Atmosphäre, Ausgabe Februar 2021

TRGS 723
Gefährliche explosionsfähige Gemische - Vermeidung der Entzündung gefährlicher explosionsfähiger Gemische; Ausgabe Juli 2019, zuletzt geändert Oktober 2020

TRGS 724
Gefährliche explosionsfähige Gemische - Maßnahmen des konstruktiven Explosionsschutzes, welche die Auswirkung einer Explosion auf ein unbedenkliches Maß beschränken, Ausgabe Juli 2019

TRGS 560
Luftrückführung bei Tätigkeiten mit krebserzeugenden, erbgutverändernden und fruchtbarkeitsgefährdenden Stäuben; Ausgabe Januar 2012

REGULATIONS OF GERMAN ACCIDENT INSURERS

DGUV Grundsatz 350-001 (BGG 904): DGUV Grundsätze für arbeitsmedizinische Untersuchungen
G 40 : Krebserzeugende und erbgutverändernde Gefahrstoffe - allgemein
(in German only)

DGUV Regel 112-190
Benutzung von Atemschutzgeräten, Ausgabe November 2021
(in German only)

LINKS

Statement concerning the rating as carcinogenic, mutagenic or toxic for reproduction (in german only, source BAuA)
Exposure-risk relationship documentations
International Limit Values
OECD Screening Information DataSet (SIDS)
OECD Screening Information DataSet (SIDS)
OECD Screening Information DataSet (SIDS)
The MAK Collection for Occupational Health and Safety
DGUV Information 213-098: List of substances - lesson in schools (in German only)

REFERENCES

Quelle: 00001
IFA: Erfassungs- und Pflegehandbuch der GESTIS-Stoffdatenbank (nicht öffentlich)
Data acquisition and maintenance manual of the GESTIS substance database (non-public)

Quelle: 00022
G. Hommel
"Handbuch der gefährlichen Güter" Loseblattsammlung mit Ergänzungslieferungen
"Handbook of dangerous goods " loose-leaf collection with supplement deliveries
Springer-Verlag, Heidelberg

Quelle: 00132
The Merck-Index; 15th Edition 2013

Quelle: 00220
IUCLID-CD-ROM, Year 2000 edition; European Commission, Joint Research Centre, Institute for Health and Consumer Protection, European Chemicals Bureau; Ispra, Italy

Quelle: 00305
G. Hommel "Handbuch der gefährlichen Güter" ("Handbook of Dangerous Goods"), CD-ROM "Hommel interaktiv" ab Version 15.0 Springer-Verlag, Berlin Heidelberg

Quelle: 00330
U. Welzbacher "Neue Datenblätter für gefährliche Arbeitsstoffe nach Gefahrstoffverordnung" Loseblattsammlung mit Ergänzungslieferungen, WEKA-Verlag, Augsburg

Quelle: 00419
CHEMINFO - Chemical Profiles Created by CCOHS

Quelle: 00438
Registry of Toxic Effects of Chemical Substances (RTECS)

Quelle: 00450
HSDB-Datenbankrecherche 2003

Quelle: 00454
Hazardous Substances Data Bank (HSDB)

Quelle: 01211
GHS-Sicherheitsdatenblatt, Merck
GHS Material Safety Data Sheet, Merck

Quelle: 01231
GHS-Sicherheitsdatenblatt, Thermo Fisher Scientific
GHS Material Safety Data Sheet, Thermo Fisher Scientific

Quelle: 01251
GHS-Sicherheitsdatenblatt, Alfa Aesar (eine Marke von Thermo Fisher Scientific)
GHS Material Safety Data Sheet, Alfa Aesar (A Thermo Fisher Scientific Brand)

Quelle: 01502
GHS-Sicherheitsdatenblatt des Herstellers
GHS Material Safety Data Sheet of the manufacturer

Quelle: 02085
ChemSpider
www.chemspider.com

Quelle: 05300
TRGS 510 "Lagerung von Gefahrstoffen in ortsbeweglichen Behältern" Ausgabe Dezember 2020

Quelle: 05323
Begründungen zur Bewertung von Stoffen als krebserzeugend, erbgutverändernd oder fortpflanzungsgefährdend (s. Kapitel LINKS)

Quelle: 05326
TRGS 910 "Risikobezogenes Maßnahmenkonzept für Tätigkeiten mit krebserzeugenden Gefahrstoffen " Ausgabe Februar 2014, zuletzt geändert und ergänzt April 2023

Quelle: 06002
L. Roth, U. Weller
"Gefährliche Chemische Reaktionen" Loseblattsammlung mit Ergänzungslieferungen, ecomed-Verlag ("Dangerous chemical reactions" loose-leaf collection with supplement deliveries)

Quelle: 06806
GESTIS-STAUB-EX-Datenbank des IFA www.dguv.de/ifa/gestis-staub-ex

Quelle: 07514
Verordnung (EU) Nr. 2020/217 der Kommission vom 4. Oktober 2019 zur Änderung der Verordnung (EG) Nr. 1272/2008 des Europäischen Parlaments und des Rates über die Einstufung, Kennzeichnung und Verpackung von Stoffen und Gemischen (EG-GHS-Verordnung, 14. Änderung). Die Einstufungen gelten ab dem 9. September 2021.

Quelle: 07520
Europäische Chemikalienagentur ECHA: Informationen über registrierte Substanzen
European Chemicals Agency ECHA: Information on registered substances

Quelle: 07580
Bekanntmachung der Liste der wassergefährdenden Stoffe im Bundesanzeiger vom 10.08.2017, zuletzt geändert 24.11.2023

Quelle: 07619
DFG Deutsche Forschungsgemeinschaft: The MAK-Collection for Occupational Health and Safety, nach Veröffentlichungsdatum zu finden unter:
bis 2002 Verlag Chemie
ab 2002 Online: http://onlinelibrary.wiley.com/book/10.1002/3527600418/topics?filter=#
ab 2020 Online:
https://series.publisso.de/en/pgseries/overview/mak/dam/allContents/alphabetical

Quelle: 07620
DFG: Arbeitsmedizinisch-toxikologische Begründungen von BAT-Werten; Verlag Chemie

Quelle: 07636
L. Parmeggiani (Edt.) "Enzyclopedia of Occupational Health and Safety" 3. Auflage, International Labour Office, Genf 1983

Quelle: 07638
M. Daunderer "Toxikologische Enzyklopädie - Klinische Toxikologie - Giftinformation, Giftnachweis, Vergiftungstherapie" Loseblatt-Ausgabe, ecomed-Verlagsgesellschaft mbH, Landsberg

Quelle: 07748
American Conference of Governmental Industrial Hygienists "Documentation of the threshold limit values and biological exposure indices Loseblattsammlung mit Ergänzungslieferungen

Quelle: 07866
G.D. Clayton, F.E. Clayton (edt.) "Patty's Industrial Hygiene and Toxicology" Volume II "Toxicology" Fourth Edition, John Wiley & Sons, New York 1993

Quelle: 07979
W.M. Grant, J.S. Schuman: Toxicology of the eyes; 4th Edition, Charles C Thomas Publisher, Springfield, Illinois; 1993

Quelle: 08013
Ludewig "Akute Vergiftungen" 9. Auflage, Wissenschaftliche Verlagsgesellschaft, Stuttgart 1999

Quelle: 08112
DFG Deutsche Forschungsgemeinschaft: MAK- und BAT-Werte-Liste 2023, Senatskommission zur Prüfung gesundheitsschädlicher Arbeitsstoffe, Mitteilung 59; GMS PUBLISSO

Quelle: 99983
Liste arbeitsmedizinisch-toxikologischer Standardwerke (2)
List of standard references regarding occupational health and toxikology (2)

Quelle: 99996
Projektgebundene arbeitsmedizinisch-toxikologische Literatur (2)
Project related bibliographical references regarding occupational health and toxikology (2)

Quelle: 99999
Angabe des Bearbeiters
Indication of the editor

Identification | Characterisation | Formula | Physical and chemical properties | Toxicology / Ecotoxikology | Occupational health and first aid | Safe handling | Regulations | Links | Literature register