IFA
Institut für Arbeitsschutz der
Deutschen Gesetzlichen Unfallversicherung

Zinc powder or dust, stabilised

IDENTIFICATION

Zinc powder or dust, stabilised
Zinc powder, stabilised
Zinc dust, stabilised

ZVG No:	500052
CAS No:	7440-66-6
EC No:	231-175-3
INDEX No:	030-002-00-7 030-001-01-9

CHARACTERISATION

SUBSTANCE GROUP CODE

134000 Metals

STATE OF AGGREGATION

The substance is solid.

PROPERTIES

powder
grey
odourless

CHEMICAL CHARACTERISATION

The term "zinc dust stabilised" means that it has been "phlegmatised". Phlegmatisation is achieved by adding a minimum amount of oxygen (hence the maximum value for the metal content in the specification for zinc dust) during zinc dust production. This small amount of oxygen in the production process forms a thin layer of zinc oxide around each zinc dust grain, ensuring a reduced reactivity ("safer" explosion characteristics, unwanted chemical reactions to oxides, carbonates, ...) of the zinc dust.
This means that the zinc dust is stabilized without the addition of any stabilizers simply by creating a stable zinc oxide layer around each grain by the reaction of zinc dust with oxygen during the manufacturing process.

Combustible substance, poorly flammable.

Reaction with water.
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: 06002 06806

FORMULA

Zn

Molar mass: 65,39 g/mol

PHYSICAL AND CHEMICAL PROPERTIES

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

MELTING POINT

Melting point: 420 °C
Reference: 01221

BOILING POINT

Boiling Point: 907 °C
Reference: 01221

DENSITY

DENSITY
Value: 7,133 g/cm³
Temperature: 25 °C
Reference: 01221

SOLUBILITY IN WATER

reaction
Reference: 02110

HAZARDOUS REACTIONS

Hazardous chemical reactions

Risk of explosion in contact with:
oxidizing agents
nitric acid
water
ammonium nitrate + water
ammonium nitrate + heat
ammonium sulfide (aq. solution)
barium nitrate
barium peroxide
lead azide
cadmium
chlorates
chlorinated rubber
chromium trioxide
hydrazine nitrate (heat)
hydroxylamine (heat)
iodine + water
potassium chlorate
potassium nitrate
catalysts (metals)
humid air
manganese nitrate
manganese dichloride (heat)
sodium chlorate
sodium peroxide
nitrates
nitroanisole/sodium hydroxide
performic acid
residues of reduction reactions
sulfur/heat
carbon tetrachloride
zinc chloride as impurity

The substance can react dangerously with:
alkali hydroxide
bases
chlorine
fluorine
lyes
acids
arsenic trioxide
bromine pentafluoride
calcium chloride solution (hydrogen)
chlorine trifluoride
hexachloroethane
potassium dioxide
nitrobenzene
carbon disulfide
selenium (heat)
silver, destruction in batteries
tellurium (heat)

Residues of zinc from reduction reactions readily ignite.

OCCUPATIONAL HEALTH AND FIRST AID

Routes of exposure | Toxic effects |
First Aid

ROUTES OF EXPOSURE

Main routes of exposure

The major route of exposure for the dusts of metal zinc (Z) at workplaces is via the respiratory tract. [7619, 99999]

Respiratory tract

Quantitative data on the systemic availability of metal Z or of zinc compounds are neither available for humans nor from animal experiments. Due to the oxidation of zinc that occurs to form zinc oxide in the presence of oxygen or other oxidants in air and aqueous media, absorption is possible when these substances occur as aerosols. [99999] Studies on rats, rabbits and guinea pigs determined a pulmonary retention (deposition of the particles) of 5% to 20% of the fine particles of zinc oxide (particle size 0.17 µm), which is poorly soluble in water. [2050]
Inhaled zinc oxide dusts were removed from the lungs of rats with a half-life in the region of several hours. [7619]
It must be assumed that particles removed from the respiratory tract via ciliary clearance mechanisms enter the digestive tract, where the zinc is absorbed after dissolving in the gastric acid depending on zinc supply status and diet. [2050, 99999].

Skin

Reliable data on the extent of dermal zinc oxide absorption is not available. Exposure of intact skin is assumed to entail minor systemic availability in humans [7748]
However, zinc that is initially bound in the skin can slowly become systemically available at a later point in time. [2050]
Increased zinc absorption from Z was described in the case of injured skin (skin burns). [2050]

Gastrointestinal tract

Since Z is soluble in diluted mineral acids, it can be assumed that oral intake of Z entails the formation of zinc ions that can be absorbed in a similar way as after application of water or acid-soluble zinc compounds depending on particle size and retention time in the acidic gastric juice. A case report on an oral toxicity case after oral zinc intake (see below) supports this assumption. [7619, 99999]

TOXIC EFFECTS

Main toxic effects

Acute effects:
substance-specific data are not available. As with zinc oxide after inhalation of fumes, metal fume fever will presumably occur as toxic effect; oral intake is assumed to entail motor disorders and drowsiness. [99999]
Chronic effects:
substance-specific data are not available. As in the case of inhaled zinc oxide, the toxic effects will presumably include disorders of the respiratory tract; oral intake is expected to trigger taste disturbance, disorders of the copper homoeostasis and effects of a copper deficiency with changes of the haematological and clinical-chemical parameters in parallel with the effects caused by water-soluble zinc compounds. [7619, 7520, 99999]

Acute toxicity

In valid trials on rabbit eyes, metal Z (zinc dust, particle size about 4 µm) caused mild, rapidly subsiding reddening of the conjunctiva and swelling. Corneal changes or injuries of the epithelium did not occur. Similar temporary and rapidly subsiding effects were also described after exposure to coarser zinc dust (approx. 150 µm). [7520]
Findings on the skin-irritating potential of Z are not available. The following findings are relevant in case of oxidation under the formation of zinc oxide and prolonged skin contact [99999]:
Zinc oxide is used as an ointment ingredient in dermatology. Indications of an irritative potential were not derived from this use. [7619]
In valid trials on test animals, zinc oxide showed no skin-irritant potential. [7520]
Zinc compounds have been used in cosmetic and pharmaceutical products for decades without yielding indications of an allergic potential. This is also true for the results of patch tests in probands. [7619]
In an animal experiment, zinc oxide showed no skin-sensitising potential according to the findings of several maximisation tests on guinea pigs. [7619, 7520]
Data on the systemic toxicity involved in dermal exposure of humans to Z are not available.
In an animal experiment with zinc oxide, dermal application of 2000 mg per kg of body weight in a valid trial caused neither local nor clinical or systemic effects (LD50 › 2000 mg per kg of body weight). [7520]
Findings on the toxicity in humans after inhalative exposure to metal Z are not available. Processing of zinc in procedures involving high temperatures, e.g. cutting and welding of galvanised steel, must be expected to form ultrafine zinc oxide particles as a result of zinc oxidation. Inhalation of these fumes can cause metal fume fever with severe impairment of the respiratory tract and general malaise (coughing, shortness of breath, flu-like symptoms). Such effects were observed after 2-hour exposure to 5 mg zinc oxide/m³ and after 6-hour exposure to 2.5 mg zinc oxide/m³. Exposure to 0.5 mg zinc oxide/m³ (ultrafine particles with 0.04 µm or fine particles with 0.29 µm) triggered no symptoms in healthy subjects. The complaints are reversible, long-term effects are not known, however, extensive studies are pending. [7619]
In a valid animal experiment, the highest achievable dust concentration of 5.41 mg Z/m³ (“zinc dust superfine 620“, 85% of the particles have sizes ≤ 8.2 µm, 27% of the particles have sizes of ≤ 5 µm) resulted in temporary breathing difficulties and lethargy as well as to spasms of the eyelids after 4-hour exposure of rats; however, lethal effects were not observed during the 14-day follow-up observation period. The examination revealed changes in the lungs in the form of bright spots. [7520]
One case report describes a toxicity in a 16-year old adolescent after oral intake of 12 g metal zinc over 2 days (114 mg per kg of body weight on day 1 and 57 mg per kg of body weight on day 2). The described symptoms included drowsiness, lethargy, unsteady gait and writing problems, but no gastrointestinal disorders as those that are characteristic after oral intake of soluble zinc compounds. Increased amylase and lipase values were found in the serum eight days after intake of Z. [7619]
In a valid trial on rats, oral administration of 2000 mg zinc dust per kg of body weight (“zinc dust superfine 620“, particle size about 5 µm) caused bristled fur and diarrhoea, but no clinical symptoms or lethal effects (LD50 › 2000 mg/kg KG). [7520]

Chronic toxicity

Data on the toxicity of Z involved in dermal exposure are not available. The following findings might be relevant in view of the oxidation of zinc to zinc oxide that occurs to different degrees depending on structure and particle size as well as temperature, humidity and acid exposure as well as oxygen content [99999]:
Dermal exposure of rats to nanoscale zinc oxide entailed a prolonged blood coagulation time and a reduction of the collagen level in the skin. After termination of the exposure, the effects were reversible within 14 days (LOAEL: 75 mg per kg of body weight per day, no NOAEL). [7520]
Z-specific data on the toxicity caused by inhalative exposure are not available. The following findings appear to be relevant because of the oxidation of zinc at air under formation of zinc oxide, particularly at higher temperatures [99999]:
For information on metal fume fever, please refer to the explanations under “Acute toxicity”.
Studies on 234 workers with mean inhalative exposure times to zinc oxide dusts (2.5–4.5 mg/m³, chiefly Z, 25% of the particles were ‹ 3 µm) of 5.5 years yielded no indications of pulmonary dysfunctions or asthmatic complaints. [7619]
In an animal experiment with guinea pigs, up to 6-day inhalation of ultrafine zinc oxide particles (3 hours per day) caused deterioration of the lung functions as well as inflammatory changes in the lung tissue at 5.5 mg zinc oxide/m³, which subsided within 3 days after termination of the exposure (4.4 mg zinc/m³, particle size 0.05 µm). In further studies, no such changes occurred after 5-day exposure to 2.7 mg zinc oxide/m³, however, signs of an inflammatory reaction could be found in the BAL (bronchoalveolar lavage) as early as on day 2 after exposure to 2.3 mg zinc oxide/m³. Changes in the BAL were also described in rats after exposure to 6.9 mg zinc oxide/m³ (other concentrations were not investigated, particle size 1.6 µm) during the 7-day exposure and 1 week thereafter. [7619]
A 13-week subchronic inhalation study conducted in accordance with OECD directive involving the exposure of rats to coated zinc oxide particles (coating: triethoxycaprylylsilane) or uncoated zinc oxide (size ‹ 3 µm each) showed no adverse effect (NOAEC) at 1.5 mg/m³. Exposure to 4.5 mg/m³ (LOAEC) coated and uncoated zinc oxide trigged mild changes in the nasal epithelium as well as slight signs of inflammatory reactions in the lungs. [7520]
Data pertaining to the long-term oral toxicity of Z in humans are lacking. Due to the solubility of Z in diluted acids, continued exposure must be assumed to entail similar effects as those observed after oral intake of soluble zinc salts. Increased oral intake of zinc compounds for the supplementation of zinc was reported to entail disorders in the balance of the (also essential) trace element copper with reduced activity of the copper-containing enzymes as well as haematological changes such as anaemia, neutropenia (reduced number of neutrophilic white blood cells), changed cholesterol levels as well as immunological changes and gastrointestinal disorders. [2077]
Copper deficiency and anaemia were already observed after oral long-term dosages of approx. 2.1 mg zinc per kg of body weight per day and constitute the most sensitive parameter in cases of increased systemic zinc exposure. An oral dose of 0.43 mg zinc per kg of body weight per day was indicated as NOAEL in which effects on the copper metabolism do not longer occur. [7619] The recommended daily absorption amount for women is 7.0 mg zinc per day, for men it is 9.5 mg zinc per day. [435]
In an animal experiment, oral administration of several water-soluble zinc compounds (zinc sulphate-heptahydrate, zinc chloride, zinc acetate, zinc glycerinate) in the drinking water or in the feed of mice and rats caused reduced weights from 1.5 to 3.6 mg zinc per kg of body weight per day; 5.3 to 9.7 mg zinc per kg of body weight per day caused changed liver enzyme values in the serum, and values from 12 mg zinc per kg of body weight per day reduced the level of red blood cells and haemoglobin in the blood. Changes of inner organs occurred from 50 mg zinc per kg of body weight per day (NOAEL for injuries of kidneys, pancreas, gastrointestinal tract and spleen: 13.3 mg per kg of body weight per day). [435, 7619]

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:
There is no reason to fear a risk of damage to the developing embryo or foetus when MAK and BAT values are observed.
Findings pertaining to metal Z are not available.
Zinc is an essential trace element. The majority of human studies on zinc supply address the relationship between zinc deficiency and its effects on pregnancy. There are no data pointing to an impairment of the pregnancy due to excessive zinc supply. Several studies on healthy pregnant women yielded no indications of adverse effects up to oral doses of approx. 1.3 mg zinc per kg of body weight per day. In studies on non-pregnant women, oral long-term dosages of 2.1 mg zinc per kg of body weight per day caused deficiencies of copper, which is also an essential trace element, and anaemia in studies on non-pregnant women. [7619]
Increased body temperatures occurring in case of metal fume fever after exposure to zinc oxide could constitute a risk for pregnant women, since fever (including an increase of the body temperature by 2°C or more) can trigger embryotoxic effects. However, 8-hour exposure to 0.1 mg zinc/m³ is not expected to entail increased body temperatures. [7619]
In one animal inhalation experiment on the developmental toxicity performed in accordance with OECD directive with coated zinc oxide particles (see above), exposure of pregnant rats to 7.5 mg/m³ caused mild inflammatory changes of the lungs, which was not the case after exposure to 1.5 mg/m³; developmental-toxic effects were not observed. [7520]
In one study on rats, exposure to up to the highest zinc carbonate dose (corresponding to 50 mg zinc per kg of body weight per day) caused neither maternal nor developmental-toxic effects. After administration of zinc oxide over the entire duration of the pregnancy, exposure to 300 mg zinc per kg of body weight per day entailed an increased incidence of still births, which was not the case after exposure to 120 mg zinc per kg of body weight per day. [7619]
Only few data are available on the impact on the fertility. After more than 4-week administration of high zinc sulphate doses with the feed (corresponding to 200 mg zinc per kg of body weight per day) in an animal experiment, reduced sperm mobility was observed in male rats; the number of pregnant females and living offspring was also reduced. 58-day oral administration of 303 mg zinc per kg of body weight per day (as zinc gluconate) followed by 6-day application of 266 mg zinc per kg of body weight per day entailed changes of the testicle and prostate tissues of male rats; female rats exhibited changes of the uterus; 54 mg zinc per kg of body weight per day triggered no effect. [7619]

Mutagenicity
Findings pertaining to metal Z are lacking.
Micronucleus tests on mice with coated zinc oxide particles (see above) of different sizes conducted according to OECD directive showed no clastogenic potential. [7520]
Studies conducted with various zinc compounds including poorly water-soluble zinc oxide as well as water-soluble zinc compounds largely showed no mutagenic potential in vitro. The occurrence of chromosome damage was described in the range of high, cytotoxic concentrations. Nor can a genotoxic potential of zinc compounds be derived from the overall assessment of the studies on clastogenic effects (chromosome damage and formation of micronuclei). Isolated positive findings observed after exposure to high doses or concentrations of several zinc compounds can be explained by the fact that the capacity of the cells or the total organism to regulate the zinc concentration was exceeded (or, in case of intraperitoneal injection, bypassed). However, comparable zinc concentrations are not reached under workplace conditions. [7619]
The available data on the genotoxicity did not point to a suspected germ cell-mutagenic potential. [7619]

Carcinogenicity
Findings pertaining to metal Z are lacking.
A study on approx. 4800 workers in copper and zinc plants yielded no indication of an increased cancer mortality in connection with the exposure to zinc. [7619]
Valid conclusions on the carcinogenic potential of Z and zinc compounds cannot be derived from the available animal experiments. [7619]

Biotransformation and excretion

Findings pertaining to metal Z are not available. After oxidation under the formation of zinc ions, absorption of these zinc ions is possible, which are subject to the processes described hereinafter.
Zinc is an essential trace element that occurs as bivalent cation in all tissues of the organism. It can enter proteins and other molecules or anions via electrostatic interactions with negatively charged groups. More than 300 enzymes containing zinc as cofactor are known. The total content in the human organism is said to amount to 1.5–3 g. Quantitatively, the largest zinc portion can be located in the muscles (approx. 60%), the highest concentrations are found in the bones, the hair and the prostate. In the blood plasma, zinc occurs in a concentration of approx. 1 mg/l, bound to albumin and other proteins. [7619] In the whole blood, the largest zinc proportion is found in the erythrocytes. [7620]
Increased zinc levels in the serum were reported after industrial exposure to zinc compounds. However, the determination of zinc in the whole blood or the serum is not recommended for the assessment of an industrial zinc exposure. [8093]
Half-life of the elimination ranges between 100 and 500 days in humans without strongly increased zinc supply. Exposure to high supplied doses (in the trial: 58 mg) entailed a shorter elimination half-life of 93 days. In experiments, biphasic elimination kinetics with a short biological half-life of 19 days could be determined for approx. 30% of the absorbed zinc quantity after oral administration of radioactive zinc compounds; the half-life for the remaining zinc amount was approx. 380 days. [2050]
Approx. 70%–80% of orally absorbed zinc ions are eliminated with the faeces. The zinc amount eliminated this way reflects the unabsorbed proportion from the food and from endogenous sources (bile and pancreatic juice). A considerable amount of zinc that was secreted into the intestines is re-absorbed; this is presumably the most important regulation mechanism to control the physiological zinc level in the organism. Besides excretion with the faeces, renal elimination is the second most important elimination path. About 14%–25% of the entire zinc ions are eliminated with the urine. [7619]
Moreover, minor zinc amounts can be excreted with the saliva, the hair and the sweat (particularly during heavy perspiration) and via the breastmilk. [7619]
Increased zinc levels in the blood or the urine could be confirmed in workers who had been exposed to the inhalation of zinc compounds. However, a significant correlation between external and internal zinc loads could not be identified. [7655]

Annotation

This occupational health information was compiled on 27.11.2018.
It will be updated if necessary.
This information was translated from German into English by Übersetzungsbüro Branco.

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.
[454, 99999]

Skin

Whilst protecting yourself, relocate the casualty away from the source of danger.
Remove contaminated clothing while protecting yourself.
Larger zinc amounts must at first be removed from the skin with a cloth soaked in vegetable oil, or alternatively with a dry cloth; then:
Cleanse the affected skin areas thoroughly with soap under running water.
Under no circumstances should alcohol, gasoline or other solvents be used.
After contact with large areas, in case of injuries or changes of the skin:
Arrange for medical treatment.
[454, 99999]

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.
If the casualty is unconscious but breathing lay him in a stable manner on his side.
In any case:
Arrange medical treatment.
[454, 99999]

Swallowing

Rinse the mouth and spit the fluids out.
Have the casualty immediately drink a glass of fluid (water).
Do not make the casualty vomit.
In case of spontaneous vomiting, keep the patient in a prone position with the head lower than the chest to effectively prevent the vomit from penetrating the respiratory tract.
Lay the casualty down in a quiet place and protect him against hypothermia.
In any case:
Arrange medical treatment.
[454, 99999]

Information for physicians

- Symptoms of acute toxicity:
Zinc powder is practically insoluble in water; the surfaces of zinc particles, particularly of zinc fume particles, are typically coated with zinc oxide. Zinc powder causes mild irritations of the skin and the mucosae.
Eyes: burning sensation, reddening, lacrimation; blepharospasm (spasms of the eyelids), impaired vision; mechanical injuries of the cornea might also occur depending on the type of the particles;
Skin: erythema (reddening) [99999]
Inhalation: irritation in the throat, metallic taste, coughing; moreover, fever with chills and tachycardia, muscle pain and physical weakness develop within several hours after inhalation of zinc fumes[454]. The symptoms of this metal fume fever typically subside spontaneously within 24 hours without leaving residual damage.
Ingestion: metallic taste; intake of high zinc dust doses (more than 5 g) entails nausea, vomiting, abdominal pain [454]
Absorption: systemic effects after inhalation or dermal exposure have not been described to date. Such effects would have to be expected only after very atypical, high exposures (e.g. exposure of large injured skin areas) and could be similar to those occurring after ingestion (metal fume fever is not considered a systemic effect). Systemic effects after ingestion have been described as isolated cases to date: clouded consciousness, unsteady gait (polyneuropathy after chronic exposure)[7619], injury of the pancreas [7619], the liver and the kidneys.
Moreover, chronic exposure can be expected to result in physical weakness, susceptibility to infections and coagulation disorders.

- Notes on first aid
Check whether the first aiders have rinsed the eyes after contact with the substance, otherwise this must be performed [454]. Blepharospasm requires rinsing after application of a local anaesthetic (e.g. lidocaine 2%). In all cases, the casualty must be treated by an ophthalmologist. [99999].
Check whether the first aiders have rinsed the skin after contact with the substance, otherwise this must be performed.
After substance inhalation: pronounced metal fume fever requires the application of an antipyretic.
Do not induce vomiting, no administration of activated charcoal suspension, no gastric lavage. In the event of doubt, high doses can be verified in the stomach by means of x-ray examination [10040].
Pronounced absorptive symptoms (clouded consciousness) require monitoring of the cardiovascular and respiratory functions as well as of the blood count and the zinc and copper concentration in the blood.
Inpatient monitoring is also recommended when the casualty has fever without any further symptoms until the fever has subsided.
Laboratory: in cases of metal fume fever triggered by inhalative exposure, an increased concentration of the inflammation regulator interleukine-6 could be verified in the blood. [10039]
Increased pancreas, liver and kidney values after acute oral or intravenous exposure [454, 7619]; increased zinc and decreased copper concentrations in the blood, [454] particularly after chronic exposure; chronic exposure entails a decrease of the red and white blood cells as well as a reduced number of thrombocytes (pancytopenia). [454]
Administration of a zinc-binding antidote such as pentetate calcium trisodium (CaDTPA), calcium disodium edetate (CaEDTA) or sodium dimercaptopropane sulfonate (DMPS) [10040, 10041] bears the risk of strengthening a copper deficiency and is only indicated in rare exceptional cases. CaDTPA appears to be the most effective antidote. [10041] Haemodialysis or haemoperfusion is not indicated. [454] Copper substitution can be considered at reduced copper concentrations in the blood. [454]
Determination of zinc and copper in the blood can be considered to rule out zinc toxicity.

Recommendations

Provide the physician information about the substance/product and treatment already administered.

Note:
“Zinc chloride smoke” produced for military purposes in the past basically contains zinc chloride hydrates and hydrogen chloride. The toxic effects of zinc chloride smokes are not described here.

Annotation
This first aid information was compiled on 04.02.2019.
It will be updated if necessary.
This information was translated from German into English by Übersetzungsbüro Branco.

SAFE HANDLING

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

TECHNICAL MEASURES - HANDLING

Workplace
Select ventilation measures according to the other used substances.
If there is a chance that dusts may be released, then the work room must provide adequate ventilation.
The floor should not have a floor drain.
Washing facility at the workplace required.

Equipment
Use closed apparatus if possible.
Suction off dust 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 keep workplace clean and dry.
Do not leave container open.
Sufficient ventilation must be guaranteed for refilling, transfer, or open use.
Fill only into labelled container.
Avoid rising dust.
Use an appropriate exterior vessel when transporting in fragile containers.

Cleaning and maintenance
Avoid dust formation. Dust formation that cannot be avoided must be collected regularly.
Use tested industrial vacuum cleaners or suction systems for areas with a high risk of explosion.
Do not raise dust while cleaning.
Use of a blower for cleaning is not permitted.

TECHNICAL MEASURES - STORAGE

Storage
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.
Keep container in a well-ventilated place.
Protect from moisture.

Conditions of collocated storage

Storage class 10 - 13 (Other liquids and solids)
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.
- Strongly oxidizing substances of storage class 5.1A.

Under certain conditions the collocated storage with the following sub-stances is permitted (For more details see TRGS 510):
- Gases.
- Flammable liquids of storage class 3.
- 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.
- Ammonium nitrate and preparations containing ammonium nitrate.
- Organic peroxides and self reactive substances.
- Combustible and non combustible acutely toxic substances of stora-ge classes 6.1A and 6.1B.

The substance should not be stored with substances with which hazardous chemical reactions are possible.

TECHNICAL MEASURES - FIRE AND EXPLOSION PROTECTION

Technical, constructive measures

Substance is combustible.
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.

PERSONAL PROTECTION

Body protection

Wear an apron or a lab coat.

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 P2, 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 should be worn.
Wear glasses with side protection.

Hand protection

Select hand protection according to the other used substances.

Occupational hygiene

Take heed of usual occupational hygiene measures when handling chemical substances, espacially wash the skin with soap and water before breaks and at the end of work and apply fatty skin-care products after washing.
Avoid inhalation of dust.

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.
Collect in container for toxic, inorganic residues and heavy metal salts and their solutions.
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

Wear a dust mask.
Pick up without creating dust.
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

Classes of fires

D combustible metals

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.

Special protective equipment

In the case of a fire hazardous substances can be released.
Metal oxide fume
Wear self-contained breathing apparatus.

REGULATIONS

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

EUROPEAN GHS CLASSIFICATION AND LABELLING

Classification

Hazardous to the aquatic environment, Acute Category 1; H400
Hazardous to the aquatic environment, Chronic Category 1; H410

Signal Word "Warning"

Hazard Statement - H-phrases

H410: Very toxic to aquatic life with long lasting effects.

Precautionary Statement - P-phrases

P273: Avoid release to the environment.
P391: Collect spillage.
P501: Dispose of contents/ container to an approved waste disposal plant.

Manufacturer's specification by Merck

Reference: 01211
State: 2021
Checked: 2022

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.

Reference: 99999

GHS-CLASSIFICATION OF MIXTURES

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

Reference: 99999

WORKPLACE LABELLING ACCORDING TO GERMAN ASR A1.3

Prohibition label

Do not extinguish with water

GERMAN WATER HAZARD CLASS

Substance No: 7325
WGK 2 - distinct hazard to waters

Particle size <= 1 mm
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

TECHNICAL INSTRUCTIONS ON AIR QUALITY CONTROL (TA LUFT)

Chapter 5.2.1 Overall Dust, including fine dust
The emissions of dust in the exhaust gas are not allowed to exceed the following values:

Mass flow: 0,20 kg/hr

or

Mass conc.: 20 mg/m³

The mass per unit volume of 0,15 g/m3 in exhaust gas is not allowed to be exceeded also on observance or lower deviation of a mass flow of 0,20 kg/h.

TRANSPORT REGULATIONS

UN Number: 3077
Shipping name: Environmentally hazardous substances, solid, n.o.s.
Hazard Identification Number: 90
Class: 9 (Miscellaneous items and materials)
Packing Group: III (low danger)
Danger Label: 9

Special labelling: Symbol (fish and tree)

Classification code: M7

Tunnel restrictions:
Passage allowed through all tunnels.

Reference: 01211

RECOMMENDATIONS OF MAK-COMMISSION

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

0,1 mg/m³
with reference to the respirable fraction

Peak limitation: Excursion factor 4
Duration 15 min, mean; 4 times per shift; interval 1 hour
Category I - Substances for which local irritant effects determine the exposure limit value, also respiratory allegens

Pregnancy: Group C
There is no reason to fear damage to the embryo or foetus when MAK and BAT values are observed.

Zinc and inorganic zinc compounds

2 mg/m³
with reference to the inhalable fraction

Peak limitation: Excursion factor 2
Duration 15 min, mean; 4 times per shift; interval 1 hour
Category I - Substances for which local irritant effects determine the exposure limit value, also respiratory allegens

Pregnancy: Group C
There is no reason to fear damage to the embryo or foetus when MAK and BAT values are observed.

Zinc and inorganic zinc compounds

DIRECTIVE 2012/18/EU (Seveso III)

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

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

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 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

REGULATIONS OF GERMAN ACCIDENT INSURERS

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

LINKS

International Limit Values
Risk Assessment Report
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: 00435
Organisation for Economic Cooperation and Development (OECD) "Screening Information Data Set for High Production Volume Chemicals (SIDS)", http://www.inchem.org/pages/sids.html

Quelle: 00454
Hazardous Substances Data Bank (HSDB)

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

Quelle: 01221
GHS-Sicherheitsdatenblatt, Sigma-Aldrich
GHS Material Safety Data Sheet, Sigma-Aldrich

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

Quelle: 02050
European Union "Risk Assessment Report" European Chemicals Bureau

Quelle: 02077
National Industrial Chemicals Notification and Assessment Scheme (NICNAS), Australia
https://www.nicnas.gov.au/

Quelle: 02110
National Center for Biotechnology Information:
PubChem
https://pubchem.ncbi.nlm.nih.gov/

Quelle: 05200
Kühn-Birett "Merkblätter Gefährliche Arbeitsstoffe" Loseblattsammlung mit Ergänzungslieferungen, ecomed Sicherheit, Landsberg

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

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: 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: 07635
AUERDATA 98

Quelle: 07655
D. Henschler (Hrsg.) "Analytische Methoden zur Prüfung gesundheitsschädlicher Arbeitsstoffe, Analysen im biologischen Material" Loseblattausgabe mit Ergänzungslieferungen, VCH Verlagsgesellschaft mbH Weinheim

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

Quelle: 08093
E. Bingham, B. Cohrssen (Edts.) "Patty´s Toxicology" Sixth Edition, John Wiley & Sons, New York 2012

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

Quelle: 10040
K.M. Bora, B.A. Dolcourt, A. Katiyar, C.K. Aaron
Kinetics of zinc elimination with and without chelation. [Abstract].
Clin Toxicol 2009; 47: 702-765

Quelle: 10041
J. Ruprecht
Dimaval®. Wissenschaftliche Produktmonographie. 7. Aufl., Berlin: Heyl GmbH 2008

Quelle: 10045
Persönliche Mitteilung der INITIATIVE ZINK im Netzwerk der WV Metalle, Düsseldorf

Quelle: 99999
Angabe des Bearbeiters
Indication of the editor

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