

Antimony



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

IDENTIFICATION

Antimony

ZVG No: 8390
CAS No: 7440-36-0
EC No: 231-146-5

CHARACTERISATION

SUBSTANCE GROUP CODE

133950 Semimetals

STATE OF AGGREGATION

The substance is solid.

PROPERTIES

crystalline powder
dark gray
odourless

CHEMICAL CHARACTERISATION

Combustible substance, poorly flammable.
Practically insoluble in water.
Sensitive to moisture.
Sensitive to air.
Acute or chronic health hazards result from the substance.
(see: chapter REGULATIONS).

[Substance information in Wikipedia](#)

FORMULA

Sb

Molar mass: 121,75 g/mol

PHYSICAL AND CHEMICAL PROPERTIES

[Melting point](#) | [Boiling point](#) | [Density](#) | [Solubility](#) | [Hazardous reactions](#)

MELTING POINT

Melting point: 630 °C

Reference: [01211](#)

BOILING POINT

Boiling Point: 1635 °C

Reference: [02001](#) [02110](#)

DENSITY

DENSITY

Value: 6,68 g/cm³

Reference: [00456](#)

SOLUBILITY IN WATER

practically insoluble in water

Reference: [00456](#) [02110](#)

HAZARDOUS REACTIONS

Hazardous chemical reactions

Applicable for antimony as a powder:

Risk of explosion in contact with:

iodine
alkali nitrate (heat)
ammonium nitrate
chloric acid
dichlorine oxide
difluorine oxide
potassium nitrate (heat)
metal powders
sodium nitrate (heat)

The substance can react dangerously with:

aluminium
bromine
chlorine
fluorine
oxidizing agents
nitric acid
acids
bromine pentafluoride
bromine trifluoride
chlorine trifluoride
disulfur dibromide
iodine pentafluoride
potassium dioxide
potassium permanganate
nitrosyl chloride
nitrosyl fluoride
perchloric acid
hot hydrochloric acid (compact substance)
sulfur monobromide
selenyl chloride
hydrogen (nascent)

In combustion carcinogenic antimony oxide is generated.

Electrolysis of sulfides and antimony halogenides generates an amorphous modification of antimony, which is explosive.

TOXICOLOGY / ECOTOXICOLOGY

TOXICOLOGICAL DATA

LD50 oral rat

Value: 7000 mg/kg

Environmental Quality and Safety, Supplement. Vol. 1, Pg. 1, 1975.

Reference: [02071](#)

OCCUPATIONAL HEALTH AND FIRST AID

[Routes of exposure](#) | [Toxic effects](#) |
[First Aid](#)

ROUTES OF EXPOSURE

Main routes of exposure

Metallic antimony (A.) enters the body primarily via the inhalative route.[00454]

Respiratory tract

Exposure to A. as fine metal dust or fumes occurs primarily for metallurgic processing or during production, partly also during the use of alloys. In its pure form A. is also used within the production of semiconductors.[07636]

A factor to be taken into consideration is that vapors/fumes emitted in smelting processes or other thermic procedures contain antimony trioxide in high percentages.

Inhaled A.-dusts are deposited in the respiratory tract in accordance with their particle size and are subjected to mucociliary clearance (transfer to the gastrointestinal tract).[99996]

According to indications in the literature, A. is thought to be absorbed better by inhalation than its compounds.[07636]

However, kinetic studies with A.-dust are not available.[99983]

Skin

For occupational handling of antimony the dermal uptake is not thought to be very important.

However, the absorption of minor amounts is not to be excluded for prolonged contact.[99996]

Substance specific data is not available.[99983]

Gastrointestinal tract

In working areas with dust exposure, proportionate uptake via the gastrointestinal tract is to be taken into consideration (swallowing of inhaled dusts and - in the case of insufficient personal hygiene - ingestion of contaminated food).[07636]

The absorption seems to proceed slowly and incompletely.[99996]

TOXIC EFFECTS

Main toxic effects

acute:

irritation to mucous membranes, gastrointestinal complaints

chronic:

skin damage, dust deposit in the lung, influence on the cardiac function[99996]

Acute toxicity

A.-dusts and fumes can irritate the eyes.

An irritating effect to the skin is also indicated.[07656]

Experimental data on the extent of this effect following one single contact are not available.[99999]

Corresponding to some case reports it can be understood that workers under exposure to A.-fumes/vapors already showed typical skin reactions ("antimony dermatitis", see "chronic toxicity") after a short time period. The skin reactions were attributed less to metallic A. than to antimony trioxide which was released during the melting process. Regarding possible consequences of inhalative exposure the indication is available that A. vapors can cause metal fume fever (an influenza like complex of symptoms mostly detectable in the evening after exposure).

Inhaled A. dusts are thought to produce irritative effects to the mucous membranes of the airways and to cause (after swallowing) acute irritation to the gastrointestinal tract.[99996]

An older report elaborates that workers who clearly had high exposure to pure A. dust (within a pulverization plant) suffered from vomiting and diarrhoea for several days.[07836]

Further symptoms following acute antimony intoxication which are mentioned in the literature (irritation in mouth/pharynx, dyspnoea, disturbance of heart/circulatory-, liver-, and kidney functions) are not documented by case reports for metallic A. itself.[07636]

In a test on rats after i.p. application of A. (100 mg/kg bw) damage of liver, spleen, and in particular of the heart (cause of death: oedema of the myocard) was detected.[00454]

In contrast, the toxicity following oral application to rats was low (LD50: 7 g/kg bw; symptoms not referred).[00438]

Chronic toxicity

Reports on experience of occupational handling mostly concern working places in the metallurgical industry where mixed exposures are to be expected. Corresponding to the working process, besides A. components of the original ores (antimony sulfide/ antimony oxide, silica, especially arsenic as accompanying element), alloy components or antimony oxides (in vapors/fumes to a high percentage) could also have been present.

Because of special characteristics distinct effects are seen to be specific for antimony.[99996]

However, it cannot be estimated which contribution to the development of the following findings can be attributed to metallic A. itself.[99999]

Besides an orange discoloration of the teeth (formation and deposit of antimony sulfide) characteristic skin changes are considered as a typical sign of a chronic exposure to antimony: erythematous papular eruptions which can become pustular and leave hyperpigmentation after healing up ("antimony spots"). This "antimony dermatosis" preferentially localized on moist skin areas were very frequently seen for workers simultaneously exposed to A.-vapors/fumes and heat. The aetiology is judged differently in different reports. However, the rash probably due to a toxic rather than allergic mechanism. Contact allergies to antimony were only sporadically reported (in one case a worker suffered from lichenoid dermatosis following contact with A. dust). Frequent complaints of smelters and blast-furnace workers exposed to A.-vapors/fumes were: irritation within the nasopharyngeal space, trachea and bronchial area, conjunctivitis; more seldom gastrointestinal complaints, and general symptoms like muscular pain, vertigo, headache, and sleeplessness. A study on workers who had inhaled dusts with high contents of antimony trioxide and only traces of silica for many years a special form of pneumoconiosis was found. For this "antimoniosis" densely dispersed small opacities with a diameter of only $< 1 - 3$ mm were considered to be typical. These changes were detectable in the x-ray picture after a relatively long latency period. A tendency towards fibrogenic and inflammatory changes did not exist. In the course of lung function tests, the persons concerned did not show any changes which would deviate from the customary findings in the case of deposit of inert dusts. For persons exposed to mixed dusts during the mining/processing of antimony ores, the lung x-ray picture showed analogous antimony deposits as well as a silicosis ("silico-antimoniosis").

Especially from studies on workers exposed to antimony trisulfide indications were obtained that antimony can exert an influence on the heart function (reduction of the contractility of the cardiac muscle, detectable in the ECG principally by inversion of the T-wave and prolongation of the QT-interval).[99996]

These findings and increased mortality as a consequence of heart diseases in such a cohort gave rise to generally recommend a surveillance of the heart function as a preventive measure for persons exposed to antimony.[07619]

Conclusive animal experiments which could give quantitative information concerning the occurrence of the above mentioned effects under exposure to A.-dust are not available.[99983]

Reproductive toxicity, mutagenicity, carcinogenicity

Reproductive toxicity:

In a study on women exposed to antimony trioxide, -sulfide and metallic A. an increased number of premature births and spontaneous abortions was found. The birth weights of the newborn were unaffected; however, there were indications of a delayed body weight gain at one year of age.

[07980]

Results from inhalative animal experiments with high doses of A. do not exclude a corresponding effect.[00454]

However, for an assessment the data is considered not to be sufficient.

Mutagenicity:

Sufficient data is not available.

Carcinogenicity:

Sufficient data is not available.[99983]

Biotransformation and excretion

With regard to the toxicokinetics of metallic A. specific information is not available.[99983]

An indication regarding the distribution in the organism only results from the finding that workers employed in a metallurgic plant (possibly exposed to A.-fumes with a high percentage of antimony trioxide) showed the highest antimony concentrations in the lung, liver, and kidney.

It was concluded from animal experiments that antimony is eliminated in its 3 valent form with feces and urine but in its 5 valent form nearly exclusively with the urine.

Most of it is quickly eliminated.[99996]

Information on the degree of the conversion of metallic antimony into its 3 or 5 valent forms within the organism is not available.[99983]

Annotation

This occupational health information was compiled on 30.04.2001.
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.

[07656]

Skin

Remove contaminated clothing while protecting yourself.

Brush off the dusts from the skin, then:

Cleanse the affected skin areas thoroughly with soap under running water.

In case of irritation:

Arrange for medical treatment.

[07656, 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.

Arrange medical treatment.

If irritation is detectable:

As soon as possible repeatedly have the casualty deeply breath a glucocorticoid inhalation spray in.

[07656, 99999]

Swallowing

Rinse the mouth and spit the fluids out.

If the casualty is conscious have him drink 1 glass of water (ca 200 ml).

In the case of spontaneous vomiting hold the head of the casualty low with the body in a prone position.

Arrange medical treatment.

[05108, 07638]

Information for physicians

Because exposure in working areas usually is to a mixture of antimony compounds there is only little specific information on the action of pure metallic antimony. Taking general experience with antimony compounds into consideration as well as some indications for metallic antimony from animal experiments the following predictions can be made.[99983]

- Symptoms after acute poisoning:

eyes: irritation, in part conditioned mechanically (degree?)[07656]

skin: primary irritation likely to be minor or not take place; however, on moist skin possibly appearance of erythematous papular -> pustular skin eruptions after a period of delay; allergic reactions seldom; absorptive-toxic effects not to be expected

inhalation: irritation within the nasopharyngeal space (dryness, burned mucous membranes, rhinitis, nosebleeding, cough); after massive inhalation of vapors/fumes possible metal fume fever (influenza like symptoms after a latency period) or lung damage; following massive dust action (in part through swallowing) absorptive-toxic effects/gastrointestinal complaints[99996]

ingestion: strong gastrointestinal symptoms with vomiting and diarrhoea (possibly persisting for several days) -> heart/circulatory reactions; absorptive actions[07836]

absorption: unspecific symptoms (headache and muscular pain) together with gastrointestinal disturbances: loss of water and electrolytes (-> exsiccation, spasms); hypotension (-> collapse); hypoglycaemia, hypothermia; possible impact heart, liver, kidney, and blood.[08013]

- Medical advice:

Dust remaining in the eyes should be carefully removed through rinsing or by means of a cotton pad. Ophthalmologic aftercare is to be recommended.

After careful cleaning with water and soap, contaminated skin generally does not require further treatment. Skin eruption, mostly only occurring following prolonged contact, can be treated symptomatically.[99999]

After massive inhalation of dusts or fumes lung oedema prophylaxis is indicated (apply glucocorticoids at least topically). Antibiotic prophylaxis is also to be recommended. Cough caused by irritation is to be treated with codeine.[00022]

The elimination of the Sb-containing dust out of the breathing passages should be supported by means of expectorant agents.[99999]

Probably, emesis occurs spontaneously following ingestion.[07836]

Failing this, gastrolavage should be considered after intake of high doses (A. is only slowly absorbed from the gastrointestinal tract). Provided that only minor doses were ingested, the application of charcoal and of a salty laxative seems to be sufficient. Always monitor/stabilize the heart/circulatory functions.[05108]

After ingestion or massive inhalation an observation of the casualty within a hospital is indicated. Recommendation:[07656] quantification of antimony in blood and urine/if necessary chelating therapy with DMPS [99996](dimaval; parenteral application of 250 mg, initially in an interval of 3 - 4 h) or DMSA (p.o. 20 - 30 mg/kg bw/d in 3 - 6 partial doses);[07906] check/support of the heart/circulatory function (prolonged ECG monitoring), monitoring/protection of the liver and functions, monitoring of the blood parameters, electrolyte balance and of the lung function.[08013]

Recommendations

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

For persons occupationally exposed to antimony, regular monitoring of the ECG was generally recommended.[07619]

Special attention should be paid to changes of the T-wave (inversion) and to prolongation of the QT interval.[99996]

Annotation

This first aid information was compiled on 30.04.2001.
It will be updated if necessary.

SAFE HANDLING

[Handling](#) | [Storage](#) | [Fire and explosion protection](#) | [Organisational measures](#) | [Personal protection](#) | [Disposal considerations](#) | [Accidental release measures](#) | [Fire fighting measures](#)

TECHNICAL MEASURES - HANDLING

Workplace

Provision of good ventilation in the working area.

Washing facility at the workplace required.

Equipment

Use only 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.

Unsuitable materials:

Aluminium

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 rising dust.

Cleaning and maintenance

Use protective equipment while cleaning if necessary.

Avoid dust formation. Dust formation that cannot be avoided must be collected regularly.

Use tested industrial vacuum cleaners of class M.

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 in a cool, dry and well-ventilated place.

Keep contents under nitrogen.

Conditions of collocated storage

Attention! The following information on the storage class is contradictory to the GHS classification of the substance. It results from the classification according to transport law, see chapter TRANSPORT REGULATIONS.

Storage class 6.1 C (Combustible, acutely toxic Cat. 3 or chronic effecting 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.
- Other explosive substances of storage class 4.1A.
- Strongly oxidizing substances of storage class 5.1A.
- Ammonium nitrate and preparations containing ammonium nitrate.
- Organic peroxides and self reactive substances.

Under certain conditions the collocated storage with the following sub-stances is permitted (For more details see [TRGS 510](#)):

- Pyrophoric substances.
- Substances liberating flammable gases in contact with water.
- Oxidizing substances of storage class 5.1B.

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.

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.

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

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 should 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.

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 inhalation of dust.

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

The skin must be washed with soap and water before breaks and at the end of work.

Apply fatty skin-care products after washing.

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:

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 personal protective equipment (see chapter Personal Protection).

Pick up without creating dust.

Afterwards ventilate area and wash spill site.

Endangerment of watert:

The effects on water sources have not yet been classified. Yet escape into ground, lakes, or streams should be avoided under all circumstances. Inform responsible authorities in case of escape.

FIRE FIGHTING MEASURES

Suitable extinguishing media

Water (spray - not splash)

Dry extinguishing powder

Carbon dioxide

Foam

Instructions

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.

Antimony trioxide fume

Wear self-contained breathing apparatus and special tightly sealed suit.

REGULATIONS

[GHS Classification/Labelling](#) | [Workplace labelling](#) | [Air quality control](#) | [Transport Regulations](#) | [MAK recommendations](#) | [Restriction of use](#) | [Technical rules](#) | [Regulations of accident insurers](#)

EUROPEAN GHS CLASSIFICATION AND LABELLING

Classification

Carcinogenicity, Category 2; H351

Specific Target Organ Toxicity (repeated exposure), Category 2; H373



Signal Word "Warning"

Hazard Statement - H-phrases

H351: Suspected of causing cancer.

H373: May cause damage to organs through prolonged or repeated exposure.

Precautionary Statement - P-phrases

P201: Obtain special instructions before use.

P280: Wear protective gloves/protective clothing/eye protection/face protection.

P308+P313: IF exposed or concerned: Get medical advice/attention.

Manufacturer's specification by Thermo Fisher Scientific

Reference: [01231](#)

State: 2020

Checked: 2021

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](#)

Precept label



Use safety goggles



Wear safety gloves

TECHNICAL INSTRUCTIONS ON AIR QUALITY CONTROL ([TA LUFT](#))

Chapter 5.2.2 Inorganic dusts

Class III

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: 5 g/hr

or

Mass conc.: 1 mg/m³

Specified as Sb.

TRANSPORT REGULATIONS

Attention! The following information on classification according to transport legislation is contradictory to the GHS classification of the substance:

UN Number: 2871

Shipping name: Antimony powder

Hazard Identification Number: 60

Class: 6.1 (Toxic Substances)

Packing Group: III (low danger)

Danger Label: 6.1



[Classification code](#): T5

Tunnel restrictions:

Passage forbidden through tunnels of category E.

Reference: [07902](#)

RECOMMENDATIONS OF [MAK-COMMISSION](#)

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

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 active form.

RESTRICTIONS OF USE / BANS OF USE

REACH Regulation (EC) No 1907/2006 Annex XVII

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 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

REGULATIONS OF GERMAN ACCIDENT INSURERS

[DGUV Regel 112-190](#)

Benutzung von Atemschutzgeräten, Ausgabe November 2021
(in German only)

LINKS

[International Limit Values](#)

[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: 00438

Registry of Toxic Effects of Chemical Substances (RTECS)

Quelle: 00454

Hazardous Substances Data Bank (HSDB)

Quelle: 00456

Hazardous Substances Data Bank (HSDB) in PubChem

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: 02001
International Chemical Safety Cards (ICSC)

Quelle: 02071
Toxicological Data, compiled by the National Institute of Health (NIH), USA, selected and distributed by Technical Database Services (TDS), New York, 2009

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

Quelle: 05108
Kühn-Birett-Merkblätter: 108. Ergänzungslieferung; 06/98

Quelle: 05158
Kühn-Birett-Merkblätter: 158. Ergänzungslieferung; 2/2003

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: 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: 07636
L. Parmeggiani (Edt.) "Encyclopedia 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: 07656
D. Walsh (Hrsg.) "Chemical Safety Data Sheets; Vol. I Solvents, Vol. II Metals, Vol. III Corrosives and Irritants, Vol. IV Toxic Chemicals, Vol.V Flammable Chemicals" University of Technology, Loughborough 1990

Quelle: 07836
L. Lewin "Gifte und Vergiftungen" 6. Auflage, Karl F. Haug Verlag, Heidelberg 1992

Quelle: 07902
BAM: Datenbank [Gefahrgut-Schnellinfo](#)

Quelle: 07906
G. Heinemeyer, U. Fabian (Hrsg.) "Der Vergiftungs- und Drogennotfall. Allgemeine und spezielle Maßnahmen im ärztlichen Not- und Rettungsdienst" 3. Auflage, Ullstein Mosby, Berlin/Wiesbaden 1997

Quelle: 07980
IARC - International Agency for research on cancer: Monographs on the evaluation of carcinogenic risks to humans WHO, Lyon; Serie

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 toxicology (2)

Quelle: 99996

Projektgebundene arbeitsmedizinisch-toxikologische Literatur (2)

Project related bibliographical references regarding occupational health and toxicology (2)

Quelle: 99999

Angabe des Bearbeiters

Indication of the editor

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

This material data sheet was carefully compiled. However no liability can be assumed for the data content, whatever the legal cause may be.