

Titanium, Powder



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IDENTIFICATION

Titanium, Powder

ZVG No: 8170
CAS No: 7440-32-6
EC No: 231-142-3

CHARACTERISATION

SUBSTANCE GROUP CODE

134000 Metals

STATE OF AGGREGATION

The substance is solid.

PROPERTIES

crystalline powder
metallic bright

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.

The metal is non-flammable in compact form.

Practically insoluble in water.

Not volatile.

At elevated temperatures titanium absorbs oxygen, nitrogen and hydrogen which leads to embrittlement and increased hardness.

[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

Ti

Molar mass: 47,88 g/mol

PHYSICAL AND CHEMICAL PROPERTIES

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

MELTING POINT

Melting point: 1677 °C

Reference: [00132](#)

BOILING POINT

Boiling Point: 3277 °C

Reference: [00132](#)

DENSITY

DENSITY

Value: 4,5 g/cm³

Temperature: 20 °C

Reference: [01211](#)

SOLUBILITY IN WATER

practically insoluble in water

Reference: [00454](#)

HAZARDOUS REACTIONS

Hazardous chemical reactions

The following dangerous reactions refer to titanium as a powder:

Risk of explosion in contact with:

chlorine
oxidizing agents
nitric acid
potassium carbonate
potassium chlorate (heat)
potassium nitrate (heat)
potassium permanganate
silver nitrate / dry
water vapour / air

The substance can react dangerously with:

halogens
oxygen
lead oxides
bromine trifluoride
halogenated hydrocarbons
carbon dioxide (heat)
copper(II) oxide
air
metal carbonates (heat)
metals (heat)
nitrylfluoride
sulfur (heat)
silver fluoride (heat)
nitrogen (heat)
trichloroethene
trichlorotrifluoroethane
water / heat

OCCUPATIONAL HEALTH AND FIRST AID

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

ROUTES OF EXPOSURE

Main routes of exposure

At workplaces titanium (T) is chiefly resorbed as dusts via the respiratory tract.[00083]

Respiratory tract

Specific studies on the resorption of the metal dust via the respiratory tract are not available.[99983]
It is estimated that T is partially removed relatively rapidly from the respiratory tract via mucociliary clearance mechanisms (similar to titanium oxide), while a small portion is retained in the lungs and only slowly removed via the lymphatic system.[00083]
The relatively high T levels in the lungs of the exposed persons also point to a partially very slow lung clearance.[99996]

Skin

Resorption of metallic T via the skin does not possess any toxicological significance.[99983]

Gastrointestinal tract

Resorption of T and its compounds via the digestive tract has not been sufficiently examined.
[99983]

The available data and observations have led to the conclusion that resorption of metallic T is very minor.[07866]

TOXIC EFFECTS

Main toxic effects

Acute effects: Acutely toxic effects have not been reported;[99983]

Chronic effects: Dust deposits in the lungs.[00083]

Acute toxicity

Acutely toxic effects triggered by metallic T have not been reported, despite long years of application.

The metal is assessed as biologically virtually 'inert' and practically non-toxic.[99983]

Extremely high tissue compatibility has been confirmed by experiences from the medical field:

The application of T as material for surgical implants did not reveal any indications of irritative effects or a sensitising potential; minor amounts of T that entered the adjacent tissues when released from the implant did not trigger any adverse effects.[00083]

The effects to be expected in the industrial context are only those that occur after general exposure to dusts:

Mechanical irritations might occur to the eyes and the skin.[99999]

Inhalation can trigger non-specific reactions to a massive exposure to dust in the respiratory tract. [99996]

Specific toxic effects are not expected after oral intake of T dusts; there are specific oral toxicity values from animal experiments.[99983]

Chronic toxicity

The question of potential long-term effects after dust inhalation is interesting in the work health context.

Available relevant studies and tests chiefly pertain to titanium oxide, less to metallic titanium. [00083]

Summarising the findings, it was found that most of the epidemiological studies indicate that elementary T and titanium oxide do not induce pronounced irritations and fibrogenous effects in the lung tissue.

A report on diseases of the respiratory tract (e.g., chronic bronchitis) after long-term exposure to metallic T and titanium oxide (more details on the exposure conditions were not provided) is not supported by similar findings of other researchers.[99996]

Examinations of the lung tissue of persons who had been exposed to titanium dusts did not reveal any signs of fibrogenous characteristics.[07656]

A fibrogenous potential of T metal dusts could not be confirmed under defined conditions in animal experiments; intratracheal instillation of 50 mg of T (particle diameter < 2 µm) did not cause any fibrogenous changes in the lung tissue of rats in the course of 6 months.[00083]

Reproductive toxicity, mutagenicity, carcinogenicity

Reproductive toxicity: Appropriate information pertaining to metallic T is not available.[99983]

Mutagenicity: Pure T and two T alloys were tested in microbiological and in-vitro tests on mammalian cells. Indications of a mutagenic potential were not found.[99996]

Carcinogenic potential: Sufficient information unavailable.[07728]

Biotransformation and excretion

According to the available information titanium is not an essential element for the human organism. [00083]

Only few data are available on the metabolism.[99983]

Studies on the distribution of titanium in the organism showed strongly varying levels in the organs. The highest levels – particularly in persons who had been exposed to T or titanium oxide – were frequently found in the lungs.

Increased titanium levels were also found chiefly in the liver, the kidneys and certain lymph nodes. It could be confirmed that titanium (details on the form were not provided) can penetrate the placenta and pass the blood/brain barrier.

After oral intake the substance is almost completely eliminated with the faeces; under normal conditions elimination with the urine is minor.[00083]

Further elimination paths are not known.[99983]

The half-life for the titanium elimination from the human organism was estimated to amount to approx. 320 or 640 days.[00083]

Annotation

This occupational health information was compiled on 03.03.1997.

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.

[07750]

Skin

Remove contaminated clothing while protecting yourself.

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

[07750]

Respiratory tract

Whilst protecting yourself remove the casualty from the hazardous area and take him to the fresh air.

The following symptoms occur after massive inhalation:

In the case of breathing difficulties have the casualty inhale oxygen.

Arrange medical treatment.

However, these first aid measures are expected to be required only in very rare cases.

[07750, 99999]

Swallowing

Insignificant for commercial practices.

Rinse the mouth and spit the fluids out.

Essential damage is not to be expected even after the ingestion of larger amounts, but the following is still recommended:

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

Arrange medical treatment.

[99983, 07750, 99999]

Information for physicians

Acute toxicities due to inhalation or other forms of intake of metallic titanium (T) have not been published to date.[99983]

The substance is considered as a non-hazardous working material;[99992] therefore, many standard sources leave it unaddressed.[99983]

- However, symptoms of an acute exposure might include:

The eyes: Slight mechanical-irritative effects, and exceptional cases might involve corneal erosion; cutaneous: Superficial irritations are only possible after intensive cleaning procedures.[99999]

Allergic skin reactions triggered by T have not been observed.[00083]

Massive inhalation would cause a dust deposit in the lungs, as caused by other 'inert' dusts.

This acute exposure remains largely without symptoms, even if the bronchial lumen and lung volume can be subject to reactive impacts.

However, inhalation exposure (-> 'titanium coniosis') also provides an x-ray contrast that can be used for diagnostic purposes.[99992]

Even the ingestion of large amounts of insoluble TiO₂ did not trigger any systemic effects; metallic T is[07742] assumed to be resorbed only to a very minor extent in the gastrointestinal tract.[07866]

Orally administered T is not assessed as acutely toxic.[07718]

- First medical assistance:

Life-threatening conditions -> necessary first aid measures seem to be excluded.

Rinse affected eyes, remove trapped particles with cotton swabs, as required; the casualty must be examined by an ophthalmologist.

Gently clean contaminated skin (or have it cleaned); a skin care product should then be applied.

Inhalation of the substance requires treatment of the symptoms: Expectorants/secretolytics might be applied; however, in most cases bringing the casualty into the fresh air is sufficient, and oxygen supply should rarely be required.

Cases of accidental oral intake of large amounts of T require administration of a mild laxative and dietary fibres.[99999]

Recommendations

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

Annotation

This first aid information was compiled on 03.03.1997.

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

Provision of good ventilation in the working area.

Washing facility at the workplace required.

When handling excessive amounts of the substance an emergency shower is required.

Equipment

Use closed apparatus if possible.

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.

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.

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.

Clean equipment and floor with a great amount of water, never dry.

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.

Place fragile vessels in break-proof outer vessels.

Keep container tightly closed in a cool, dry and well-ventilated place.

Store apart from sources of ignition and heat.

Substance is sensitive to air, protect from air/oxygen.

Keep contents under inert gas.

Conditions of collocated storage

Storage class 4.2 (Pyrophoric or self-heating 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.
- Other explosive substances of storage class 4.1A.
- Strongly oxidizing and oxidizing substances of storage classes 5.1A and 5.1B.
- Ammonium nitrate and preparations containing ammonium nitrate.
- Organic peroxides and self reactive substances.
- Combustible and non combustible acutely toxic substances of storage classes 6.1A and 6.1B.

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

- Flammable solid substances or desensitized substances of storage class 4.1B.
- Substances liberating flammable gases in contact with water.
- Combustible toxic or chronically acting substances of storage class 6.1C.
- Noncombustible toxic or chronically acting substances of storage class 6.1D.
- Combustible corrosive substances of storage class 8A.
- Noncombustible corrosive substances of storage class 8B.
- Combustible liquids of storage class 10.
- Combustible solids of storage class 11.

The substance should not be stored with substances with which hazardous 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

Area with fire risk.

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).

Observe the smoking prohibition!

Absolutely no welding in the working area.

Only work with vessels and lines after these have been thoroughly rinsed and inerting.

Work done with fire or open flame should only be carried out with written permission if the risk of fire or explosion cannot be completely eliminated.

Do not use any tools that cause 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.

An escape and rescue plan must be prepared when the location, scale, and use of the work-site so demand.

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

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

PERSONAL PROTECTION

Body protection

Wear flameproof protective clothing.

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 P1, colour code white.

Eye protection

Sufficient eye protection should be worn.

Wear glasses with side protection.

Hand protection

The use of resistant protective gloves is recommended.

Skin protection cremes do not protect as effectively against the substance as protective gloves.

Therefore suitable protective gloves should be preferred as far as possible.

Currently there is no information available regarding suitable glove materials.

Experience says that polychloroprene, nitrile rubber, butyl rubber, fluoro-caoutchouc, and polyvinyl chloride are suitable as glove materials for protection against un-dissolved solids.

Occupational hygiene

Take heed of usual occupational hygiene measures when handling chemical substances, especially 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:

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

Shut off all sources of ignition.

Evacuate area. Warn affected surroundings.

Wear a dust mask.

Pick up without creating dust.

Use non-sparking tools.

Afterwards ventilate area and wash spill site.

Endangerment of watert:

No hazards to sources of water are to be feared if released into water, drainage, sewer, or the ground.

FIRE FIGHTING MEASURES

Classes of fires

D combustible metals

Suitable extinguishing media

Metal fire extinguisher

Dry sand

Dry cement

Unsuitable extinguishing media

Water

Carbon dioxide

Instructions

Seek immediate cover in case of sudden release and raising of large quantities of dust.

If possible, take container out of dangerous zone.

Avoid direct contact of the substance with water.

Shut off sources of ignition.

Longer observation of the fire source is required.

Special protective equipment

Wear self-contained breathing apparatus.

REGULATIONS

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

EUROPEAN GHS CLASSIFICATION AND LABELLING

Classification

Flammable solids, Category 1; H228



Signal Word "Danger"

Hazard Statement - H-phrases

H228: Flammable solid.

Precautionary Statement - P-phrases

P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

P370+P378: In case of fire: Use sand for extinction.

Manufacturer's specification by Merck

Reference: [01211](#)

State: 2017

Checked: 2019

The metal in compact form is not classified as a hazardous substance.

Reference: [07520](#)

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

Warning label



Caution - inflammable material

Precept label



Use safety goggles

GERMAN WATER HAZARD CLASS

Substance No: 10886

non-hazardous to waters

Titanium, 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: 2546

Shipping name: Titanium powder, dry

Class: 4.2 (Substances liable to spontaneous combustion)

Hazard Identification Number: 43 (RID)

Packing Group: I (high danger)

Hazard Identification Number: 40

Packing Group: II/III (medium/low danger)

Danger Label: 4.2



Classification code: S4

Tunnel restrictions:
Depending on the packing group.

Reference: [07902](#)

UN Number: 1352
Shipping name: Titanium, powder, wetted with not less than 25 %
water
Hazard Identification Number: 40
Class: 4.1 (Flammable solids)
Packing Group: II (medium danger)
Danger Label: 4.1



Classification code: F3

Tunnel restrictions:
Passage forbidden through tunnels of category E.

Reference: [07902](#)

UN Number: 2878
Shipping name: Titanium sponge granules or titanium sponge
powders
Hazard Identification Number: 40
Class: 4.1 (Flammable solids)
Packing Group: III (low danger)
Danger Label: 4.1



Classification code: F3

Tunnel restrictions:
Passage forbidden through tunnels of category E.

Reference: [07902](#)

RESTRICTIONS OF USE / BANS OF USE

REACH Regulation (EC) No 1907/2006 Annex XVII

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,
- “whoopie” 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 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 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](#)

[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: 00083

Environmental Health Criteria (Serie), WHO, Genf

Quelle: 00132

The Merck-Index; 15th Edition 2013

Quelle: 00454

Hazardous Substances Data Bank (HSDB)

Quelle: 00500

RÖMPP Online ab 2003

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: 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-STAU-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,
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Quelle: 07656

D. Walsh (Hrsg.) "Chemical Safety Data Sheets; Vol. I Solvents, Vol. II Metalls, Vol. III Corrosives and Irritants, Vol. IV Toxic Chemicals, Vol.V Flammable Chemicals" University of Technology, Loughborough 1990

Quelle: 07718

R. Ludewig, KH. Lohs "Akute Vergiftungen" 8. Auflage, Gustav Fischer Verlag, Jena 1991

Quelle: 07728

A. Berlin, M. Draper, E. Krug, R. Roi, M.Th. van der Venne (Edt.) "The Toxicology of chemicals" Band 1 "Carcinogenicity" Commission of European Communities- Industrial Health and Safety, ECSC-EEC-EAEC, Bruessel-Luxemburg, 1990

Quelle: 07742

British Industrial Biological Research Association "Toxicity Profiles" BIBRA Information Department, Carshalton

Quelle: 07750

R. E. Lenga "The Sigma-Aldrich Library of Chemical Safety Data" 2nd edition, Sigma-Aldrich, Milwaukee 1988

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: 07902

BAM: Datenbank [Gefahrgut-Schnellinfo](#)

Quelle: 99983

Liste arbeitsmedizinisch-toxikologischer Standardwerke (2)

List of standard references regarding occupational health and toxicology (2)

Quelle: 99992

Projektgebundene Literatur zur Ersten Hilfe

(Project related bibliographical references regarding first aid)

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

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