

SAFETY INFORMATION SHEET (SIS)

ZIRCONIUM AND ZIRCONIUM ALLOYS

Version 2, 2024-05-08

1. Identification of substance and company

1.1. Product identifier

Product name zirconium and zirconium alloys.

Corrosion, good strength and creep resisting grades in product forms: semi-finished products, bar and tube.

1.2. Relevant identified uses of the mixture and uses advised against

The products are used extensively in the most varying applications, especially where stainless steels or other materials have insufficient corrosion resistance.

1.3. Details of the supplier of the safety information sheet

Manufacturer and supplier:

Alleima AB

S-811 81 SANDVIKEN

Sweden

Tel: +46 26 426 00 00

Website: www.alleima.com

Contact: ehs.miljoskydd@alleima.com

1.4. Emergency information

In case of emergency, contact your local authority advisor.

2. Hazards identification

2.1. Classification of the mixture

Flam. Sol. 1

H228: Flammable solid.

2.2. Label elements

No signal word or hazard statement.

2.3. Other hazards

There are no hazards of concern for man or the environment from zirconium and zirconium alloys in the forms supplied.

Dust and fume may be generated during processing e.g. in welding, cutting and grinding. If airborne concentrations of dust and fume are excessive, inhalation over long periods may affect workers' health, primarily of the lungs.

3. Composition/information on ingredients

Element	CAS number	EINECS number	Concentration wt-%	Classification	Hazard statement
Zirconium	7440-67-7	231-176-9	>97	Flam. Sol. 1	H228: Flammable solid
Hafnium	7440-58-6	231-166-4	<3	Flam. Sol. 1	H228: Flammable solid

Tin	7440-31-5	231-141-8	<2	-	-
Niobium	7440-03-1	231-113-5	<2	-	-
Iron	7439-89-6	231-096-4	<0,25	-	-
Chromium	7440-47-3	231-157-5	<0,2	-	-
Nickel	7440-02-0	231-111-4	<0,1	Carc2 Skin Sens.1 STOT RE 1	H351: Suspected of causing cancer H317: May cause an allergic reaction H372: Causes damage to organs through prolonged or repeated exposure

Table 1 Composition and classification according to EC 1272/2008 regulation.

4. First aid measures

4.1. Description of first aid measures

There are no specific first aid measures developed for zirconium and zirconium alloys in massive form. Medical attention should be sought in case of an excessive inhalation of dust, a physical injury to the skin or to the eyes.

4.2. Most important symptoms and effects both acute and delayed

No relevant information has been identified.

4.3. Indication of any immediate medical attention and special treatment needed

No relevant information has been identified.

5. Firefighting measures

5.1. Extinguishing media

Zirconium and zirconium alloys in massive form are not combustible but material in the form of small chips, fine turnings or dust can self-ignite at room temperature or if exposed to any nearby heat source.

If possible; allow fire to burn out. Fire can be controlled by covering with powder from type D fire extinguisher, sand, or dry table salt. Carbon dioxide is not effective. Water applied to burning zirconium may cause an even bigger fire or an explosion.

5.2. Special hazards arising from the mixture

Care should be taken to avoid exposing small chips, fine turnings and process dust (e.g. from grinding and blasting operations) to air and fire (auto ignition temperature 330 °C/626 °F for powders). Emits toxic fumes under fire conditions.

5.3. Advice for firefighters

Dry zirconium and zirconium alloy powder burns while releasing much heat. Piled chips burn vigorously.

If a fire starts in a mass of wet metal fines, such as a drum of damp machining chips, the initial fire may be followed by an explosion. Therefore, when in doubt, individuals should leave and not attempt to extinguish the fire, but let it burn out. The explosion characteristics of such material is caused by the hydrogen and steam generated by the burning mass.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Not applicable for the product in massive form.

For fines and dust; wear appropriate respiratory and protective equipment specified in section 8. Isolate spill area and provide ventilation. Avoid breathing dust or fume. Avoid contact with skin and eyes.

6.2. Environmental precautions

Not applicable for the product in massive form.

For fines and dust; do not allow to be released to the environment.

6.3. Methods and material for containment and cleaning up

Not applicable for the product in massive form.

For fines and dust; clean spills in a manner not to disperse dust into the air. Sweep or scoop up. Do not use metallic tools or equipment due to risk of sparking.

Place in an appropriate container for further handling and disposal according to local rules.

6.4 Reference to other sections

None.

7. Handling and storage

7.1. Precautions for safe handling

There are no special technical measures involved for handling zirconium and zirconium alloys in massive form. Normal precautions should be taken to avoid physical injury from coiled or bundled products, possibly with sharp edges.

Machining operations require the use of cutting fluids to reduce the temperature of waste material which might ignite without coolant.

7.2. Conditions for safe storage, including any incompatibilities

The product is stable in storage. However, it should be kept in mind that the products may display sharp edges and a sufficiently robust place capable of carrying the significant weight of the products should be used for storage.

Keep fine turnings completely dry or very wet. When wet, the water content should be more than 25 percent by weight for maximum safety in handling. Severe explosions can result from ignition of Zirconium powder or machining fines containing moisture in the concentration range of 5-10 percent.

7.3. Specific end uses

None identified.

8. Exposure controls/personal protection

8.1. Control parameters

Elements and compounds	TD	ID	RD
Iron oxide as Fe			3,5
Chromium and its compounds as Cr	0,5		
Nickel as Ni	0,5		
Tin as Sn		2	

Table 2 Occupational Exposure Limits, NGV, (mg/m³) in Sweden.

NGV=Nivågränsvärde(One working day exposure)

TD=Total dust

ID= Inhalable dust

8.2. Exposure controls

8.2.1. Appropriate engineering controls

In the processing of all metallic materials, exposure to fume and dust must be kept below any legally imposed limits.

Dust and fume may be generated in use, e.g. by cutting, grinding and welding processes, which may contain materials subject to exposure limits. To ensure these limits are not exceeded, adequate general or local ventilation or fume extraction should be provided.

8.2.2. Individual protection measures, such as personal protective equipment

In accordance with European and national health and safety regulations, it is necessary to assess the need for personal protection equipment and appropriate approved respiratory protection should be provided for those workers at risk of inhalation. Suitable hand and eye protection should be worn where there is a risk of laceration, flying particles, welding heat radiation or contact with oils during processing.

The process of welding should only be performed by trained workers with the personal protective equipment in accordance with the laws of each member state relating to safety.

8.2.3. Environmental exposure controls

Emissions from ventilation or equipment in the work place should be controlled to assure that environmental legislation is fulfilled.

9. Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance: Solid; metallic, lustrous grey-white color

Odor: Odorless

Water solubility: Insoluble

Melting: 2125 K (1852°C, 3366 °F)

Density: 6,5 g/cm³ (0.235 lbs./in³)

9.2. Other information

Thermal conductivity, 22 W/(m °C). 0,31 W / (in. °F)

10. Stability and reactivity

10.1. Reactivity

Zirconium and zirconium alloys in massive form are stable and non-reactive under normal ambient atmospheric conditions.

Fines shall be kept away from open flame and heat.

10.2. Chemical stability

Zirconium and zirconium alloys in massive form are stable and non-reactive under normal ambient atmospheric conditions.

10.3. Possibility of hazardous reactions

Metallic or metal oxide fumes and dust may be produced during welding, grinding or cutting operations.

10.4. Conditions to avoid

Avoid creating or accumulating fines or dust.

10.5. Incompatible materials

Dissolves in hydrofluoric acid. Ignites in the presence of fluorine.

When heated above 200 °C (392 °F), reacts exothermally with chlorine, bromine, halocarbons, carbon tetrachloride, carbon tetrafluoride and freon.

10.6. Hazardous decomposition products

See section 10.3. and 10.5.

11. Toxicological information

11.1. Information on toxicological effects

Acute toxicity

Zirconium is not acute toxic.

Irritation

The exposure route of concern is inhalation. These zirconium grade products are, in massive form, not capable of being inhaled.

Corrosivity

Zirconium is not corrosive to skin.

Sensitization

Zirconium is not a dermal sensitizer.

Repeated dose toxicity

Zirconium has no specified effect for dermal, inhalation or oral exposure.

During mechanical working, flame cutting, or welding, dust, or fumes may be formed. Over long periods, inhalation of excessive airborne levels may have long term health effects, primarily affecting the lungs.

Carcinogenicity

Zirconium is not classified as carcinogenic.

Mutagenicity

Zirconium is not classified as mutagenic.

Toxicity for reproduction

Zirconium is not toxic for reproduction.

12. Ecological information

12.1. Toxicity.

No data.

12.2. Persistence and degradability

No data.

12.3. Bio accumulative potential

No data.

12.4. Mobility in soil

Not soluble in water. No data.

12.5. Results of PBT and vPvB assessment

Not relevant.

12.6. Other adverse effects

Do not allow material to be released to the environment without proper governmental permits. No further relevant information available.

13. Disposal considerations

13.1 Waste treatment methods

Surplus and scrap (waste) of zirconium and zirconium alloys is valuable commodity and in demand to produce prime zirconium alloys.

Recycling routes are well-established, and recycling is therefore the preferred disposal route.

Disposal to landfill is not harmful to the environment but is a waste of resources and therefore less desirable than recycling.

Due to the fire hazards of fines and dust; accidental fires should be controlled by covering with a dry powder type of extinguisher.

14. Transport information

For zirconium scrap (turnings), UN number 1932 is valid for land, railway, inland waterway, marine and air transport. Corresponding packaging class is IMO 4.2.

15. Regulatory information

15.1. None.

15.2. Chemical safety assessment

No chemical safety assessment has been published.

16. Other information

EU

The zirconium products per section 1 in this SIS, conform to requirements, regulations or guidance given in ECHA C&L Inventory.

Declaration

The information given in this safety information sheet is based on the present level of our knowledge and experience. The data sheet describes the products with respect to safety requirements. The data given is not intended as a confirmation of product properties and does not constitute a legal contractual relationship, nor should it be used as the basis for ordering these products.