## SECTION 1: IDENTIFICATION OF THE SUBSTANCE AND OF THE COMPANY

### 1.1. Product identifier

This product is considered as a substance

<table>
<thead>
<tr>
<th>Name:</th>
<th>High Purity/Pure Titanium Carbide - Silicon Carbide (TiC-SiC).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade Name:</td>
<td>TiC-SiC-E-HP ; TiC-SiC-S-HP ; TiC-SiC-T-HP ; TiC-SiC-R-HP ; TiC-SiC-G-HP; TiC-SiC-E-P ; TiC-SiC-S-P ; TiC-SiC-T-P ; TiC-SiC-R-P ; TiC-SiC-G-P.</td>
</tr>
<tr>
<td>EC / List no.:</td>
<td>235-120-4 / 206-991-8</td>
</tr>
<tr>
<td>CAS no.:</td>
<td>12070-08-05 / 409-21-2</td>
</tr>
<tr>
<td>REACH Registration number:</td>
<td>Not registered - R&amp;D Sample &lt; 1t/year</td>
</tr>
<tr>
<td>Description:</td>
<td>High Purity/Pure TiC-SiC-based Extrudates, Grains, Spheres. With particule size &gt; 500µm</td>
</tr>
</tbody>
</table>

### 1.2. Relevant identified uses of the substance and uses advised against

**Identified Use:** Catalyst support.

**No uses advised against identified in the registration dossier.**

### 1.3. Details of the supplier of the safety data sheet

| Manufacturer name and identification: | ACM GmbH |
| Industriestraße 1, B310 | 77731 WILLSTATT |
| Phone: +49 (0) 7852 8 1150 | e-mail: info@acmgmbh.com |

### 1.4. Emergency telephone number

**National Poisons Information Service**

Available 24 hours a day, 365 days a year

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance

Silicon Carbide (SiC) is not classified as hazardous substance according to CLP criteria (Regulation EC No 1272/2008).

Titanium Carbide (TiC) is not classified as hazardous substance according to CLP criteria (Regulation EC No 1272/2008).

Cristobalite (SiO$_2$) is classified as Danger! According to the classification provided by companies to ECHA in CLP notifications this substance causes damage to organs through prolonged or repeated exposure, may cause cancer, is suspected of causing cancer and is harmful if inhaled. Cristobalite has been classified as Group 1 carcinogens –“carcinogenic to humans” by the International Agency for Research on Cancer (IARC). But, if the crystalline silica, quartz or cristobalite (fine fraction) content in mixtures and substances is below 1%, no classification is required (see the recommendation of IMA Europe - www.crystallinesilica.eu).

2.2. Label elements

No labelling required for TiC-SiC according to CLP criteria (Regulation EC No 1272/2008).

2.3. Other hazards

Silicon Carbide (SiC) does not fulfil PBT or vPvB criteria (REACH annex XIII).

According to ACGIH SiC is insoluble or made poorly soluble particles not otherwise specified (PNOS).

Careful! Silicon carbide (SiC) may contain small amounts of SiC nanofibers (below 0.1 % w/w). Raw, dry SiC nanofibers may become airborne during handling and become respirable in some conditions.

Some agencies (especially IARC and ACGIH) list SiC whiskers/fibers as potential carcinogens, based on experimental animal data. Any potential carcinogenicity of SiC fibers is limited to chronic overexposure of dry, respirable dust. No data exists for humans.

ACM recommends limiting dust’s inhalation during handling and storage (see sections 7 and 8 for more advices).
**SAFETY DATA SHEET (SDS)**

High Purity/Pure Titanium Carbide - Silicon Carbide (TiC-SiC)

According to Regulation EC 1907/2006 (REACH)

Version 1  
Revision Date: -  
Supersede version: 2019-02-01

### SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

#### 3.1. Substance

Titanium Carbide - Silicon Carbide (TiC-SiC) is considered as a multi constituent substance according to ECHA guidance “Identification and naming of substances under REACH and CLP”.

<table>
<thead>
<tr>
<th>Designation</th>
<th>Classification according to CLP criteria</th>
<th>Concentration (w/w)</th>
</tr>
</thead>
</table>
| Silicon carbide  
Formula: β SiC  
CAS -No : 409-21-2  
EC -No : 206-991-8  
INDEX -No : NA | Not classified. | 20 – 95 % |
| Titanium carbide  
Formula: TiC  
CAS -No : 12070-08-05  
EC -No : 235-120-4  
INDEX -No : NA | Not classified. | 5 – 80 % |
| Other unclassified components | | 0 - 20 % |
| SiC nanofibers  
Formula : SiO₂ | Not classified according to CLP criteria. IARC and ACGIH list SiC whiskers/fibers as potential carcinogens. | < 0,1 % |
| Cristobalite (crystalline silica)  
Formula : SiO₂  
CAS -No : 14464-46-1  
EC -No : 238-455-4  
INDEX -No : NA | IARC classified cristobalite as Group 1 carcinogens - “carcinogenic to humans” No classification required for fine fraction under 1%. (see 2.1) | < 1 % |
| **Total** | **100 %** |
SECTION 4: FIRST AID MEASURE

4.1. Description of first aid measures

**General advice:** IN CASE OF SEVERE OR PERSISTENT DISTURBANCES, CALL A DOCTOR OR SEEK EMERGENCY MEDICAL HELP. Show the safety data sheet if possible. Take care to self-protect by avoiding becoming contaminated. Use adequate respiratory protection.

**Skin contact:** Not expected to present a significant skin hazard under anticipated conditions of normal use, but, if irritation or rash occurs:

1) Take off all contaminated clothing and shoes.
2) Immediately flush affected area with plenty of soap and water – continue for at least 10 minutes.
3) If there are signs of irritation or other symptoms seek medical attention.

Wash clothing before reuse.

**Eye contact:** Before any action on a par with eyes, wash your hands with soap and water to avoid any risk of infection.

1) Flush eyes with water thoroughly and continuously for at least 15 minutes.

   **Rinse instructions:**
   - Remove any contact lenses.
   - Keep eye wide open while rinsing.
   - Continue rinsing
   - Protect unharmed eye. Avoid splashing
   - Water flow always from the nose to the ear
   - Move the eye in all directions

2) Once done rinse, cover the eye with a compress.

3) If eye irritation, pain, swelling, lachrymation or photophobia persists, consult a physician, preferably an ophthalmologist.

**If swallowed:** Not expected to present a significant ingestion hazard under anticipated conditions of normal use. Do not induce vomiting unless if this is indicated by the physician or Poison Center. Do not give milk or alcoholic beverages.

1) Rinse mouth well. Do not give anything orally.
2) Get medical attention immediately
3) Keep them warm and get medical advice immediately
4) When vomiting occurs spontaneously, make the body leaned to prevent from inhaling to the bronchus.

Never give anything by mouth to an unconscious person.
SAFETY DATA SHEET (SDS)

High Purity/Pure Titanium Carbide - Silicon Carbide (TiC-SiC)

According to Regulation EC 1907/2006 (REACH)

Version 1  Revision Date:  -  Supersede version: 2019-02-01

**If inhaled:** If dust is inhaled, and if symptoms of pulmonary involvement develop:

1) Remove from exposure and move to fresh air immediately.
2) Ensure good air circulation. Remove anything that could be tightened, like a collar, a tie, a belt or a girdle.
3) If breathing is difficult, give oxygen if possible or assisted ventilation, (do not use mouth to mouth).
4) If unconscious, place in recovery position.
5) Get medical aid

4.2. Most important symptoms and effects, both acute and delayed

Silicon carbide is a mechanical irritant, prolonged contact may cause skin abrasion and may cause tearing and redness.

If dust is inhaled, any symptoms of pulmonary involvement may be develop (coughing, wheezing, or shortness of breath).

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

No specific treatment required.

SECTION 5: FIRE FIGHTING MEASURES

5.1. Extinguishing media

**General information**

Combustible substance, poorly flammable.

**Suitable extinguishing media**

- ABC dry chemical
- alcohol-resistant foam,
- CO2,
- water fog
- Sand
- Fire blanket

**Extinguishing media not to be used for safety reasons**

Careful! Unlike sprays, powerful jets can disperse the firebox and aggravate the fire.

Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

5.2. Special exposure hazards arising from the substance

Silicon oxides and carbon oxides.
5.3. Protective Equipment and Precautions for Firefighters

Wear an approved positive pressure self-contained breathing apparatus in addition to standard firefighting gear.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Limit dust formation, use disposable (FFP3-EN149) dust protection mask.
Ensure adequate ventilation.
Keep away from ignition sources.

6.2. Environmental precautions

Be careful not to be dispersed into the air and rivers.

6.3. Methods and material for containment and cleaning up

Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section.
Avoid generating dusty conditions. Provide ventilation.

6.4. Reference to others sections

Refer to Section 8 for PPE
Refer to Section 4 for FIRST AID MEASURES
Refer to Section 5 for FIRE-FIGHTING MEASURES
Refer to Section 13 for DISPOSAL CONSIDERATIONS

SECTION 7: HANDLING AND STORAGE

Advices relating to storage premises apply to workshops where the product is handled. Risk management measures should be adapted to the operating conditions in accordance with product’s exposure conditions (if dispersive use, amount used, frequency, containment level ...)

ACM highly recommends limiting dust’s inhalation during handling and storage.
### 7.1. Precautions for safe handling

**Hygiene measures:**
- Smoking, eating and drinking should be prohibited.
- Keep working clothes separately from street clothes.
- Do not wear work clothes soiled in places such as offices, meeting rooms, relaxation areas, company restaurants or cafeterias.
- Do not leave the property with work clothes or personal protective equipment.
- Wash contaminated clothing before reuse (Note that the leather or other porous materials cannot be cleaned: once contaminated, they should be disposed of as chemical waste).
- Wash thoroughly after handling this product and before breaks.
- Always wash up before eating, smoking or using the facilities
- If necessary, take a shower after working.

**Organizational measures:**
- Training and information for workers
- Search for safer products or processes less exponents
- Limit working time for workers exposed
- Establish a procedure for chemical purchases (taking into account quantities and packaging)
- Managing the flow and storage of chemicals (unnecessary inventory, limiting the quantities stored ...)
- Waste Management (Do not use empty container before they have been cleaned).
- Establish Routine maintenance of facilities
- Restricting access to local

**Additional specific measures to inhalation risk:**
- Provide adequate local ventilation (10 to 15 air volume / hour). Use only in a well-ventilated area
- Avoid dust formation
- Reduce friction and impact between crude and grains
- It is recommended to work in an engineered closed system where respirable dust may be exhausted.
- When dispersed in water, solvent, polymer, or other carrier material (when wetted), TiC-SiC dust is non-respirable and non-hazardous.
7.2. Conditions for safe storage, including any incompatibilities

<table>
<thead>
<tr>
<th>Conditions of storage rooms and vessels</th>
<th>Storage in dry area and in a sealed container. Keep container closed where possible. Avoid dust generation. Identify the contents of all containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advice of storage of incompatible materials</td>
<td>Don’t store together with acids and oxidizing agents.</td>
</tr>
<tr>
<td>Further information of storage</td>
<td>None</td>
</tr>
</tbody>
</table>

7.3. Specific end use(s)

Apart from the uses mentioned in SECTION 1.2, no other specific uses are stipulated.
SECTION 8: EXPOSURES CONTROL / PERSONAL PROTECTION

8.1. Exposure limits

Exposure limits: Ingredients with workplace control parameters

<table>
<thead>
<tr>
<th>Substance</th>
<th>Silicon carbide</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS No.</td>
<td>409-21-2</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Limit value - Eight hours</th>
<th>Limit value - Short term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>10 mg/m³ (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 mg/m³, respirable aerosol</td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>10 mg/m³</td>
<td>0.1 fibres/cm³, respirable fraction</td>
</tr>
<tr>
<td>Canada - Ontario</td>
<td>10 mg/m³ (1)(2)</td>
<td>3 mg/m³ (2)(3)</td>
</tr>
<tr>
<td></td>
<td>0.1 fibres/cm³ (3)(4)</td>
<td></td>
</tr>
<tr>
<td>Canada - Québec</td>
<td>10 mg/m³</td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>0.1 fiber/cm³</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>10 mg/m³, respirable fraction</td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>10 mg/m³ inhalable fraction</td>
<td>4 mg/m³ fibers, respirable fraction</td>
</tr>
<tr>
<td>Latvia</td>
<td>6 mg/m³</td>
<td></td>
</tr>
<tr>
<td>New Zealand</td>
<td>10 mg/m³ (1)</td>
<td></td>
</tr>
<tr>
<td>People's Republic of China</td>
<td>8 mg/m³ inhalable fraction</td>
<td>4 mg/m³ respirable fraction</td>
</tr>
<tr>
<td>Singapore</td>
<td>10 mg/m³</td>
<td></td>
</tr>
<tr>
<td>South Korea</td>
<td>10 mg/m³</td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>10 mg/m³ inhalable aerosol</td>
<td>3 mg/m³ respirable aerosol</td>
</tr>
<tr>
<td>Switzerland</td>
<td>10 mg/m³ inhalable aerosol</td>
<td>3 mg/m³ respirable aerosol</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>10 mg/m³ inhalable aerosol</td>
<td>4 mg/m³ respirable aerosol</td>
</tr>
<tr>
<td>USA - NIOSH</td>
<td>10 mg/m³ total dust</td>
<td>5 mg/m³ respirable fraction</td>
</tr>
<tr>
<td>USA - OSHA</td>
<td>15 mg/m³ total dust</td>
<td>5 mg/m³ respirable dust</td>
</tr>
</tbody>
</table>

Remarks:
Australia: (1) This value is for inhalable dust containing no asbestos and < 1% crystalline silica.
SAFETY DATA SHEET (SDS)
High Purity/Pure Titanium Carbide - Silicon Carbide (TiC-SiC)

According to Regulation EC 1907/2006 (REACH)

Canada - Ontario: (1) Inhalable aerosol (2) The value is for particulate matter containing no asbestos an <1 % crystalline silica. (3) Respirable aerosol. (4) Respirable fibres: length >5µm; aspect ratio =3:1, as determined by the membrane filter method at 400-450 times magnification (4-mm-objective), using phase contrast illumination

New Zealand: (1) The value is for inhalable dust containing no asbestos and <1 % free silica.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Cristobalite, total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS No.</td>
<td>14464-46-1</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Limit value - Eight hours</td>
</tr>
<tr>
<td>Australia</td>
<td>0,1 mg/m³ (1)</td>
</tr>
<tr>
<td>Belgium</td>
<td>0,05 mg/m³</td>
</tr>
<tr>
<td>Canada - Ontario</td>
<td>0,05 mg/m³(1)</td>
</tr>
<tr>
<td>Denmark</td>
<td>0,15 mg/m³</td>
</tr>
<tr>
<td>France</td>
<td>0,05 mg/m³ respirable aerosol</td>
</tr>
<tr>
<td>Hungary</td>
<td>0,15 mg/m³ respirable aerosol</td>
</tr>
<tr>
<td>New Zealand</td>
<td>0,1 mg/m³ (1)</td>
</tr>
<tr>
<td>Singapore</td>
<td>0,05 mg/m³ respirable aerosol</td>
</tr>
<tr>
<td>South Korea</td>
<td>0,05 mg/m³ (respirable dust)</td>
</tr>
<tr>
<td>Spain</td>
<td>0,05 mg/m³ (1)</td>
</tr>
<tr>
<td>Sweden</td>
<td>0,05 mg/m³ (1)</td>
</tr>
<tr>
<td>Switzerland</td>
<td>0,15 mg/m³ respirable aerosol</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>0,075 mg/m³ respirable dust</td>
</tr>
<tr>
<td>USA - NIOSH</td>
<td>0,05 mg/m³</td>
</tr>
<tr>
<td>USA - OSHA</td>
<td>0,5(30/(%silica+2))</td>
</tr>
</tbody>
</table>

Remarks: Australia: (1) Respirable dust, Canada – Ontario: (1) Respirable aerosol, France Bold type: Restrictive statutory limit values, Ireland: (1) Respirable fraction, New Zealand: (1) respirable aerosol, Spain: (1) Respirable fraction, Sweden: (1) Respirable dust.

Titanium Carbide (CAS N°: 12070-08-05): The product has no critical values that have to be monitored at workplace.
DN(M)EL

The Derived No- or Minimum Effect Level (DN(M)EL) is the level of exposure above which a human should not be exposed to a substance. Please note that when more than one summary is provided, DN(M)EL values may refer to constituents of the substance and not to the substance as a whole. More detailed information is available in the REACH Registration dossiers.

<table>
<thead>
<tr>
<th>SUBSTANCE</th>
<th>TARGET</th>
<th>EXPOSURE</th>
<th>MOST SENSITIVE STUDY</th>
<th>DNEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicon Carbide</td>
<td>workers</td>
<td>inhalation</td>
<td>acute toxicity</td>
<td>94 mg/m³</td>
</tr>
<tr>
<td></td>
<td>general population</td>
<td>inhalation</td>
<td></td>
<td>23 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dermal</td>
<td></td>
<td>200 mg/kg bw/day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>oral</td>
<td></td>
<td>13 mg/kg bw/day</td>
</tr>
<tr>
<td>Titanium Carbide</td>
<td>workers</td>
<td>inhalation</td>
<td>acute toxicity</td>
<td>No hazard identified</td>
</tr>
<tr>
<td></td>
<td>general population</td>
<td>inhalation</td>
<td></td>
<td>No hazard identified</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dermal</td>
<td></td>
<td>No hazard identified</td>
</tr>
<tr>
<td></td>
<td></td>
<td>oral</td>
<td></td>
<td>35 mg/kg bw/day</td>
</tr>
</tbody>
</table>

Predicted No-Effect Concentration (PNEC)

Data not available.

8.2. Exposure controls

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Use personal protective equipment properly maintained. You must inspect protections before each use. Keep personal protective equipment in a clean place away from the work area.

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Eye/face protection:

It is recommended to contact lens wearers to use corrective lenses. If dust level is high use dust proof safety goggles tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).
**Skin protection:**
If the contact with the product cannot be avoided, use protective gloves which guarantee full protection, eg. PVC, neoprene or rubber. The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

**Respiratory protection:**
Avoid inhaling the dust; if in specific circumstances, compliance cannot be achieved, use a disposable (P3) dust protection mask.

**Thermal hazards:** No

**Environmental exposure controls:** No special measures required.

### SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES
Unless otherwise indicated, tests were carried out at 20 °C and at normal atmospheric pressure.

#### 9.1 Physical and chemical properties
- **Physical state:** Solid
- **Colour:** Grey to black.
- **Odour:** Odourless.
- **Odor Threshold:** Not applicable.
- **pH:** Not applicable.
- **Boiling point:** Not applicable.
- **Melting point:** > 2000°C
- **Flash point:** Not applicable.
- **Evaporation rate:** Not applicable.
- **Flammability:** Not determined.
- **Auto ignition temperature:** Not determined.
- **Solubility:** Insoluble in water, solvents and acids.
- **Participation coefficient n-octanol/water:** Not applicable
- **Vapor Pressure:** Not applicable.
- **Explosive limits:** Not determined.
- **Density:** 3.2 to 4.9 g/cm³
- **Bulk density:** From 0.1 to 2 g/cm³.
- **Decomposition temperature:** Not determined.
SAFETY DATA SHEET (SDS)

High Purity/Pure Titanium Carbide - Silicon Carbide (TiC-SiC)

According to Regulation EC 1907/2006 (REACH)

Version 1

Viscosity, dynamic: Not applicable.
Explosive properties: Not determined.
Oxidizing properties: Not determined.

9.2 Other information

Miscibility: Not determined for the substance
Conductivity: Not determined for the substance

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity

None under normal processing. No hazardous reactions known.

10.2. Chemical stability

This material is stable. No hazardous reactions known.

10.3. Possibility of hazardous reactions

1) It gradually generates the carbonate and the silicate by reacting with the fused alkali.
2) It’s resolved by melted sodium carbonate, the sulfuric acid alkali, the boric oxide, and the lead chromate.
3) It reacts explosively when it is heated with the mixture of the potassium dichromate and lead chromate.
4) It’s converted to the silicide by heated with oxides of copper, iron, nickel, platinum, and manganese.

10.4. Conditions to Avoid

It should not be mixed with the strong oxidant such as the mixture of the potassium dichromate and lead chromate.

10.5. Incompatible Materials

Strong oxidant such as the mixture of the potassium dichromate and lead chromate and acids.
10.6. Hazardous Decomposition Products

Silicon oxides and carbon oxides.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

All information provided below refers to the public available information in the silicon carbide’s or in the titanium carbide’s REACH registration dossier. For the cristobalite, the information is from the IMA Europe (see www.crystallinesilica.eu)

a) Acute toxicity:

Route of Exposure: Inhalation

Silicon Carbide

Test: CL50 - Routes of Exposure: Inhalation – species: Rat
Bibliographic source: British Journal of Industrial Medicine 1993; 50: 807-813
Executive summary: Silicon carbide (SiC) dust and other dusts for comparison were injected intratracheally at a high dose (50 mg) into rats and the response of the lungs and the lymph nodes was studied after an appropriate experimental period. The indices studied were: histological changes in the lung and lymph nodes, organ weights, the formation of collagenous fibres, and the appearance of quartz typical areas. No changes in the tissues studied in terms of damaging fibrogenic effects could be found after eight months (first series) and three and 12 months (second series). In particular the histological findings and the absence of quartz typical areas as well as the quantitative determination of collagen fibres show that SiC had no harmful effects on tissues. The substance SiC dust as such can be considered as inert from the experimental results based on qualitative and extremely sensitive procedures.
Interpretation of results: practically nontoxic.

Titanium Carbide

No data available.

Cristobalite

There is no specific acute toxicity data at doses that enable a categorical decision on the acute inhalation toxicity classification for any form of crystalline silica at 100%. Acute inhalation toxicity is not expected based on read across to an OECD compliant study, with a substance that contains 45% cristobalite and gives no indication of lethality. Hence further testing is not warranted in the interest of animal welfare.
Route of Exposure: Oral

Silicon Carbide

Study generated according to internationally accepted testing guidelines. (2008)
Test: DL50 - Routes of Exposure: Oral – species: Rat - NOAEL : 2 000 mg/kg bw
According to an acute oral toxicity test conducted with silicon carbide (crude and grains) it can be stated that the substance shows no orally toxic characteristics. The oral LD$_{50}$ in rats was determined to be > 2000 mg/kg body weight.
Interpretation of results: nontoxic

Titanium Carbide

Executive summary: In an acute oral toxicity study according to OECD guideline 420 (fixed dose procedure), groups of fasted, CD-1 mice (10 males and 10 females) were given a single oral dose of Titanium dioxide (>99%) in 0.5 % hydroxypropylmethylcellulose K4M (HPMC, K4M) at a dose of 5g/kg body weight and were observed for 14 days. An oral LD$_{50}$ (males/females) of more than 5 g/kg body weight could be established. As none of the animals died the LD0 is 5 g/kg body weight.
Interpretation of results: practically nontoxic, A LD$_{50}$ > 5000 mg/kg bw was established.

Cristobalite

The acute oral LD$_{50}$ of cristobalite is greater than 2000 mg/kg.

Route of Exposure: Skin contact

Silicon carbide

Study generated according to internationally accepted testing guidelines. (2008)
Test: DL50 - Routes of Exposure: Skin contact – species: Rat - Duration of exposure: 24h – NOAEL : 2000 mg/kg. According to an acute dermal toxicity test conducted with silicon carbide (crude and grains) it can be stated that the substance has no acute dermal toxic characteristics. The dermal LD$_{50}$ in rats was determined to be > 2000 mg/kg body weight.
Interpretation of results: nontoxic

No data available for titanium carbide and cristobalite.
b) Skin corrosion/irritation

Silicon Carbide

Study generated according to internationally accepted testing guidelines. (2008)
Methods: in vivo - species: Rat - Duration of exposure: 24h - Score : 0
The substance is not a skin irritant. No skin changes at the application sites were observed throughout the observation period.

Titanium Carbide

Study performed according to the OECD Guideline 439 (2010).
Executive Summary: In this in vitro dermal irritation study with the three-dimensional human skin model EPISKIN-SM, the irritation potential of Titanium carbide was examined. The test substance was applied topically on the tissue for 15 min, and thereafter the exposed tissue culture was incubated for 42 h. A positive and a negative control were used. The determination of cytotoxic effects was performed with the MTT assay. Irritation potential of the test substance was determined based on the cytotoxicity observed (mean tissue viability). The results revealed a mean relative tissue viability higher than 50%, and hence, the test substance is not a skin irritant under the conditions of this test.
Interpretation of results: not irritating

Cristobalite

Not irritating to skin (OECD TG 404)

c) Serious eye damage/irritation

Silicon Carbide

Data waiving: Silicon carbide (crude and grains) is an inert chemical and is likely to cause mechanical eye irritation due to large particle size and shape. Mechanical eye irritation produced by silicon carbide would camouflage any chemical irritation that might be caused by the substance. For this reason and due to the unethical aspect of in vivo eye irritation testing of a mechanical irritant, it was not considered reasonable to perform an eye irritation study.
In addition, documented occupational experience with the handling and use of silicon carbide (crude and grains) has revealed no cases of eye or dermal corrosion (i.e. irreversible damage to the skin or to the eye).
Titanium Carbide

Study performed according to OECD Guideline 405 (Acute Eye Irritation / Corrosion).

Executive Summary: In a primary eye irritation study according to OECD 405, 0.1 g of titanium carbide was instilled into the conjunctival sac of one eye each of three female New Zealand White rabbits (age approximately 13 weeks). Eyes were not washed. Animals were observed for a total of 72 hours. Irritation was scored by evaluating conjunctival redness, conjunctival chemosis, iris, and cornea. Only slight effects have been observed which were fully reversible within 72 hours. Neither mortalities nor significant clinical signs of toxicity were observed. In this study, titanium carbide is not an eye irritant.

Interpretation of results: not irritating

Cristobalite

Not irritating to eye (OECD TG 405)

d) Skin sensitisation

No data available for Silicon carbide and cristobalite.

Titanium Carbide

Study performed according to OECD Guideline 429 (Skin Sensitisation: Local Lymph Node Assay)

Executive Summary: In this dermal sensitization study with titanium carbide in acetone/olive oil 4:1 (v/v), young adult female CBA/CaOlalHsD mice were tested using the Local Lymph Node Assay (LLNA). 25 µl of the test substance in solvent were applied on the entire dorsal ear surface of each animal. The following concentrations were used: 12.5, 25 and 50%.

Acetone/olive oil 4:1 was used as negative control. Phenylenediamine was tested as a positive control in a prior assay. The application was repeated daily for three consecutive days. The doses applied were selected based on a pre-screening assay. Five days after the 1st application 250 µL 20 µCi 3H-methyl thymidine was injected intravenously to all mice (diluted concentration: 80 µCi/mL). All animals were sacrificed five hours after the aforementioned injection. The draining ear lymph nodes were excised into PBS and single cell suspension of lymphocyte was isolated. Cells were precipitated with 5% trichloroacetic acid at 4 °C for 18 hours. The radioactivity was measured in a β-counter.

Stimulation indices (ratio of 3H-methyl thymidine incorporation into lymph node of test animals relative to that for control animals)≥ 3 were considered a positive response. The results revealed the following SI: 1.8, 1.7 and 1.9 for the concentrations of 12.5, 25 and 50%, respectively. No signs of toxicity were detected in any of the treated animals. In this study, Titanimium carbide is not a dermal sensitizer.

Interpretation of results: not sensitising
e) Respiratory sensitisation

No data available for Silicon carbide, Titanium carbide and cristobalite.

f) Germ cell mutagenicity

Silicon Carbide

In vitro study generated according to internationally accepted testing guidelines.

Conclusions: In conclusion, it can be stated that during the described mutagenicity test and under the experimental conditions reported, the test item extracts did not cause gene mutations by base pair changes or frameshifts in the genome of the tester strains used. Therefore extracts (polar and non-polar) of SiC, TRS-9899-100F are considered to be non-mutagenic in this bacterial reverse mutation assay.

Titanium Carbide

No data available.

Cristobalite

Cristobalite has a genotoxic and mutagenic effect mainly through its inflammatory effects. Respirable cristobalite was unable to cause increased HPRT mutations in rat lung epithelial cells in vitro.

g) Carcinogenicity

Silicon Carbide

Results of current intraperitoneal carcinogenicity studies with mineral and vitreous fibres (1996).

The study includes some 50 groups of male or female Wistar rats tested in three series. Except for one untreated group and 3 vehicle control groups, the animals were injected intraperitoneally (i.p.) once or repeatedly with dust suspensions and then examined, after lifetime observation up to 30 months, for tumours in the abdominal cavity. 1 granular dust (silicon carbide), 2 asbestos dusts (crocidolite, tremolite) and 11 vitreous fibre dust samples were administered. 5 of the vitreous fibre types were fine fibre fractions from 4 commercial insulation wools and 1 experimental wool, the others were prepared by milling glass microfibres, which have, per se, a small diameter range. The dosage per rat differed over a wide range. The lowest dose was 0.04 x 10^9 crocidolite fibres in 0.5 mg dust, and the highest amounted to 20 x 10^9 glass fibres in 1000 mg divided into 40 weekly injections.
Two mesotheliomas were found in a total of 395 rats treated with saline or granular silicon carbide (250 or 1000 mg).

Eleven fibre dusts produced dose-dependent mesotheliomas at rates of up to 97%, but the calculated fibre number > 5 µm in length required for inducing a 25% tumour risk differed between the fibre samples tested in the relation of 1 to about 1000. UICC-like crocidolite heads the ranking order; the glass fibre B-01, which possesses a low durability in the body, ends it together with a rather thin sample of glass fibre type B-09. The stone fibre MMVF-21 takes a high place in the ranking order, similar to the tremolite sample.

**Titanium Carbide**

**Bibliographic source:** Pulmonary Responses of Rats Exposed to Titanium Dioxide (TiO2) by Inhalation for Two Years, Toxicol Appl Pharmacol 79:179-192, 1985.

**Executive summary:** In a combined repeated dose and carcinogenicity study Titanium dioxide was administered to 400 male and female Crj: CD(SD) rats by inhalation at nominal concentrations of 0, 10, 50, and 250 mg/m³ 6 hours a day, 5 days a week for 24 months. There were no abnormal clinical signs, body weight changes, or excess mortality in any exposed group. Exposed groups showed slight increases in the incidence of pneumonia, tracheitis, and rhinitis with squamous metaplasia in the anterior nasal cavity. The lung reaction was characterized by dust-laden macrophage (dust cell) infiltration in the alveolar ducts and adjoining alveoli with hyperplasia of type II pneumocytes. Exposure to 50 and 250 mg/m³ resulted in dose dependent dust cell accumulation, a foamy macrophage response, type II pneumocyte hyperplasia, alveolar proteinosis, alveolar brochiolarization, cholesterol granulomas, focal pleurisy, and dust deposition in the tracheobronchial lymph nodes. The pulmonary lesions with massive dust accumulation appeared to be the result of an overwhelmed lung clearance mechanism at 250 mg/m³ exposure. Bronchioloalveolar adenomas and cystic keratinizing squamous cell carcinomas occurred at 250 mg/m³ exposure.

Based on the findings at the low dose (alveolar cell hyperplasia, broncho/bronchiolar pneumonia) the concentration of 10 mg/m³ is considered as NOEC for non-neoplastic changes in this study.

Bronchioloalveolar adenomas and cystic keratinizing squamous cell carcinoma occurred at 250 mg/m³ TiO2 exposure (the tumours produced were ultimately characterized as primarily benign pulmonary keratin cysts (Warheit and Frame, 2006)), while no compound-related lung tumors were found in rats exposed either to 10 or 50 mg/m³. Thus, the concentration of 50 mg/m³ represents the NOEC for carcinogenicity in rats.

**Conclusions:** A NOEC of Titanium dioxide of 50 mg/m³ for carcinogenicity, and a NOEC of 10 mg/m³ for non-neoplastic changes was established.
Cristobalite

Lung cancer excess risk is demonstrated only under high occupational exposures to Respirable crystalline silica. The lung cancer excess risk is restricted to subjects who contracted silicosis.

h) Reproductive toxicity

No data available for silicon carbide and titanium carbide.

Cristobalite

Silica is essential for normal body function and is ingested orally via the consumption of foods containing silica naturally. An early one-generation study on Wistar rats gave no evidence of any adverse effects arising from long-term feeding of silica-rich water.

i) Target Organ Effects - single exposure (STOT SE)

No data available.

j) Target Organ Effects - repeated exposure (STOT RE)

Repeated dose toxicity: inhalation

Silicon Carbide

Publication - Toxicological investigations on silicon carbide - 1. Inhalation studies (1993) British Journal of Industrial Medicine 1993; 50: 797-806

The question of lung damage as a result of exposure to silicon carbide (SiC) was investigated by inhalation experiments to obtain information on the qualitative response of lung tissue to the test substance (SiC). For comparison, quartz, kaolinite, and tempered clay dusts were used. The indices for the effects of the dusts studied were organ weights, numbers of bronchoalveolar cells, lung surfactant phospholipid concentrations including subfractions, and lung clearance. Exposure to the test samples was carried out according to the Essen inhalation model in two independent series. The results of the two series were similar: Compared with sham controls, exposure to SiC did not affect the indices studied. Even at a low dose (a quarter of the SiC dose) quartz gave pronounced deviations in all indices. In particular, an increase in granulocytes indicated toxic properties of the dust. The long term elimination of quartz from the lung was worse than that of SiC. The kaolinite and tempered clay dusts were intermediate between SiC and quartz based on several of the indices studied. It is concluded that SiC is deposited practically inert in the lung.

Titanium Carbide: see g) carcinogenicity
Cristobalite
Prolonged and/or massive exposure to respirable crystalline silica-containing dust may cause silicosis, a nodular pulmonary fibrosis caused by deposition in the lungs of fine respirable particles of silica crystalline silica. There is a body of evidence supporting the fact that increased cancer risk would be limited to people already suffering from silicosis. Worker protection against silicosis should be assured by respecting the existing regulatory occupational exposure limits and implementing additional risk management measures where required.

In 1997, IARC (the International Agency for Research on Cancer) concluded that crystalline silica inhaled from occupational sources can cause lung cancer in humans (human carcinogen category 1). However, it pointed out that not all industrial circumstances, nor all crystalline silica types were to be incriminated. (IARC Monographs on the evaluation of the carcinogenic risks of chemicals to humans, Silica, silicates dust and organic fibres, 1997, Vol. 68, IARC, Lyon, France.)

In 2009, in the Monographs 100 series, IARC confirmed its classification of Silica Dust, Crystalline, in the form of Quartz and Cristobalite (IARC Monographs, Volume 100C, 2012).

In June 2003, SCOEL (the EU Scientific Committee on Occupational Exposure Limits) concluded that the main effect in humans of the inhalation of respirable crystalline silica dust is silicosis. “There is sufficient information to conclude that the relative risk of lung cancer is increased in persons with silicosis (and, apparently, not in employees without silicosis exposed to silica dust in quarries and in the ceramic industry). Therefore, preventing the onset of silicosis will also reduce the cancer risk...” (SCOEL SUM Doc 94-final, June 2003).

A multi-sectoral social dialogue agreement on Workers Health Protection through the Good Handling and Use of Crystalline Silica and Products Containing it was signed on 25 April 2006. This autonomous agreement, which received the European Commission’s financial support, is based on a Good Practices Guide. The requirements of the Agreement came into force on 25 October 2006. The Agreement was published in the Official Journal of the European Union (2006/C 279/02). The text of the Agreement and its annexes, including the Good Practices Guide, are available from http://www.nepsi.eu and provide useful information and guidance for the handling of products containing respirable crystalline silica. Literature references are available on request from EUROSIL, the European Association of Industrial Silica Producers.

Health & Safety Executive (specific for UK): Detailed reviews of the scientific evidence on the health effects of crystalline silica have been published by HSE (Health and Safety Executive, UK) in the Hazard Assessment Documents EH75/4 (2002) and EH75/5 (2003). The HSE points out on its website that “Workers exposed to fine dust containing quartz are at risk of developing a chronic and possibly severely disabling lung disease known as "silicosis". In addition to silicosis, there is now evidence that heavy and prolonged workplace exposure to dust containing crystalline silica can lead to an increased risk of lung cancer. The evidence suggests that an increased risk of lung cancer is likely to occur only in those workers who have developed silicosis.
Repeated dose toxicity: oral

No data available for silicon carbide and cristobalite

Titanium Carbide

Methods: A bioassay of titanium dioxide for possible carcinogenicity was conducted by administering the test chemical in feed to Fischer 344 rats and B6C3F1 mice.

Executive summary: In a chronic toxicity study Titanium dioxide (> 98%) was administered to 50 F344 rats per sex and dose in the diet at dose levels of 0, 25000, and 50000 ppm for 103 weeks. Administration of titanium dioxide had no appreciable effect on the mean body weights of rats of either sex. With the exception of white feces, there was no other clinical sign that was judged to be related to the administration of titanium dioxide. Survival of the rats at the end of the bioassay was not affected by the test chemical. Sufficient numbers of dosed and control rats of each sex were at risk for development of late-appearing tumors. In the female rats, C-cell adenomas or carcinomas of the thyroid occurred at incidences that were dose related (P = 0.013), but were not high enough (P = 0.043 for direct comparison of the high-dose group with the control group) to meet the level of P = 0.025 required by the Bonferroni criterion (controls 1/48, low-dose 0/47, high-dose 6/44). Thus, these tumors of the thyroid were not considered to be related to the administration of the test chemical.

It is concluded that under the conditions of this bioassay, titanium dioxide was not carcinogenic by the oral route for Fischer 344 rats. A NOEL of 50000 ppm was established.

k) Aspiration Hazard

No data available.

11.2. Other adverse effects

Exposure related observations in humans:

Publication British Journal of Industrial Medicine 1987; 44: 57-59

Mortality and cancer incidence among workers in an abrasive manufacturing industry

Details on study design: The study was of a cohort design with a comparison of the cancer morbidity and mortality with that of the general population. Complete personnel files were available from about 1955. These files were used to identify a cohort of men with at least five years employment sometime between 1955 and 1983. A total of 911 individuals were enrolled; 211 were women, both in administration and production, and of the 700 men, 521 were blue collar workers. All individuals were traced through the official registers and followed up until 31 December 1983 if not dead or emigrated before that date. Seven men had emigrated and eight could not be traced; all were blue collar workers. The loss to follow up was thus about 2% in total or 3% for the blue collar workers.
Information about mortality and cancer morbidity was collected through the National Death Register and the National Cancer Register, respectively. Only the underlying cause of death was considered and a restriction was made by excluding ages above 74 as the diagnostic validity is likely to decrease at higher ages. The observation periods were 1958-83 for mortality and 1958-81 for cancer morbidity, the reason for the difference in the observation period being the lack of cancer incidence data after 1981. Expected incidences were calculated with the person-year method using incidence rates for the general population, stratified for age, calendar year, and gender, for which procedure the EPILIN program was used.

Results: No significant increase was found in mortality or in cancer morbidity among the blue collar workers. Among the blue collar workers were four cases of non-malignant respiratory diseases (pneumonia (1), chronic bronchitis (2), and asthma (1)), whereas 3.2 cases of respiratory diseases would have been expected for the general population. No case of silicosis was found.

SECTION 12: ECOLOGICAL INFORMATION

All information provided below refers to the public available information in the silicon carbide‘s REACH registration dossier.

12.1. Aquatic toxicity - Component Information

Silicon Carbide

Long-term toxicity to aquatic invertebrates

Study generated according to internationally accepted testing guidelines (2008)

The observed difference in the reproduction rate is only very slight until day 19. Perhaps the significant difference at day 22 on the reproduction is just the result of a slight effect on the date of the reproduction. Additionally the comparison with last 15 finalized Daphnia reproduction studies performed at the test facility demonstrates the value of the alive offspring per adult in the control of the current test appeared to be unusual high. Therefore the result of the present study appears to be a pseudo-effect, caused by unusual high reproductive activity in the control treatment of the study. The complete set of historical data of the 15 studies of the same type done before are provided to support this conclusion.

No data available for Titanium Carbide and Cristobalite

12.2. Persistence and degradability

Chemically inert and insoluble in water; separation by mechanical processes (sedimentation, filtration, etc…)
12.3. Bioaccumulative potential

No potentials known for silicon carbide and cristobalite.
No data on bioaccumulation or levels of titanium carbide in aquatic organisms are available.

12.4. Mobility in soil

No data available.
No environmental problems known.
No data on the behavior of titanium carbide in the environment are available.

12.5. Results of PBT and vPvB assessment

Not matching PBT or vPvB criteria.

12.6. Other adverse effects

No environmental problems expected, if handled and treated in accordance with standard industrial.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Product Information

Disposal required in compliance with all waste management related state and local regulations. The choice of the appropriate method of disposal depends on the product composition by the time of disposal as well as the local statutes and possibilities for disposal. Hazardous waste according to European Waste Catalogue (EWC).

European Waste Code for the mixture : 06 08 99 (WASTES FROM THE MFSU OF SILICON AND SILICON DERIVATIVES Wastes not otherwise specified.)

Empty containers should be treated as waste

Waste treatment methods must respect the "Waste hierarchy" according to the European directive 2008/98/CE:

(a) prevention;
(b) preparing for re-use;
(c) recycling;
(d) other recovery, e.g. energy recovery; and
(e) disposal.
SAFETY DATA SHEET (SDS)
High Purity/Pure Titanium Carbide - Silicon Carbide (TiC-SiC)

According to Regulation EC 1907/2006 (REACH)

SECTION 14: TRANSPORT INFORMATION

14.1 UN number  Not applicable, non hazardous material
14.2 UN proper shipping name  Not applicable, non hazardous material
14.3 Transport hazard class(es)  Not applicable, non hazardous material
14.4 Packing group  Not applicable, non hazardous material
14.5 Environmental hazards  Not applicable, non hazardous material
14.6 Special precautions for user  Not applicable, non hazardous material
14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code  Not applicable, non hazardous material

SECTION 15: REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance

REACH

At the establishment date of the SDS:
- This substance is not identified as a substance of very high concern for Authorisation (SVHC)
- This substance is not under restrictions (Annex 17)
- This substance is not in the evaluation’s process

CLP

At the establishment date of the SDS:
- This substance is not included at CLP annex 6

15.2. Chemical Safety Assessment

Not relevant because the substance is not classified.
SAFETY DATA SHEET (SDS)

High Purity/Pure Titanium Carbide - Silicon Carbide (TiC-SiC)

According to Regulation EC 1907/2006 (REACH)

SECTION 16: OTHER INFORMATIONS

According to Article 31 of the Regulation (EC) No 1907/2006 (REACH), a Safety Data Sheet (SDS) must be provided for hazardous substances or preparations. This product does not meet the classification criteria of the Regulation (EC) No 1272/2008 (CLP). Therefore such document is outside the scope of Article 31 of REACH and the requirements for content in each section do not apply.

In accordance with REACH article 31(5), safety data sheets shall be supplied in an official language of the Member State(s) where the substance or mixture is placed on the market. This obligation, however, only applies for hazard-classified products which require a formal SDS. Since this product is not hazard-classified, this SDS is, in accordance with current regulation, provided in English language only.

Abbreviations, acronyms

REACH: Registration, Evaluation and Authorisation of Chemicals
OECD = Organization for Economic Co-operation and Development
PNOS: Particles Not Otherwise Specified
bw = body weight
bw/day = body weight/day
LD50 = 50% Lethal Dose - Chemical amount, given at once, which causes the death of 50% (one half) of a group of test animals
LC50 = 50% Lethal concentration - Concentration of a chemical in air or a chemical in water which causes the death of 50% (one half) of a group of test animals
LL = Lethal Loading
SDS: Safety Data Sheet
ECHA: European Chemicals Agency
CMR: Carcinogenic (C) or Mutagenic (M) or Toxic to reproduction (R)
PBT: Persistent, Bioaccumulative and Toxic
vPvB: veryPersistent and veryBioaccumulable
ADR: Accord for dangerous goods by road
EC: European Inventory
CAS: numerical identifier assigned by Chemical Abstracts Service (CAS)
PEL: Permissible Exposure Limits
SVHC: Substances of very high concern for Authorisation
TLV-TWA: Threshold Limit Value-Time Weighted Average (8 hours)
ACGIH: American Conference of Governmental Industrial Hygienists
SiC : Silicon carbide
TiC : Titanium carbide
w/w: weight divided by weight (mass concentration)
IARC: The International Agency for Research on Cancer
SAFETY DATA SHEET (SDS)

High Purity/Pure Titanium Carbide - Silicon Carbide (TiC-SiC)

According to Regulation EC 1907/2006 (REACH)

Version 1  Revision Date:  -  Supersede version: 2019-02-01

NA: Not applicable
ACGIH: American Conference of Governmental Industrial Hygienists
MFSU : Manufacture, Formulation, Supply And Use

General information
This document was prepared by a competent person who has been properly trained for SDS’s drafting. The information contained herein is given in good faith and is accurate to the best of knowledge at the date indicated above. It is understood by the user that any use of the product for purposes other than those for which it was designed entails potential risk. The information given herein in no way dispenses the user from knowing and applying all provisions regulating his activity. The user bears sole liability for the precautions required when using the product. The regulatory texts indicated herein are intended to aid the user to fulfil his obligations.

Tracking
Version 1  Creation

Main bibliographic sources:

Data comes from registration dossiers submitted to ECHA
Candidate List of substances for authorization
REACH Annex XIV
REACH Annexe XVII
Guidance
  • Guidance on safety data sheets
  • Guidance on the Application of the CLP Criteria
  • Guidance on labelling and packaging
ACGIH review : https://www.acgih.org/
British Journal of Industrial Medicine:
1993, vol. 50, issue 9, part 1, pages 797-806
1993, vol. 50, issue 9, part 2, pages 807-813
http://www.iarc.fr/
GESTIS International Limit Values – DGUV
https://safesilica.eu/reach-classification-and-labelling/

End of the safety data sheet