

# Material Safety Data Sheet Gallium Arsenide (EC 1907/2006 (REACH))

Revised: 18.03.2009

Revision: G

## 1. Name of Substance

- 1.1 Name of substance: Gallium arsenide  
Molecular formula: GaAs  
Molecular weight: 144.64
- 1.2 Application of substance / preparation:  
„III - V“ compound semiconductor substrate for the semiconductor industry  
(high-frequency applications, optoelectronics)
- 1.3 Name of company: Freiberger Compound Materials GmbH  
Street: Am Junger Löwe Schacht 5  
Country indicator/zip code/place: D - 09599 Freiberg  
Phone: +49 37 31 280 - 0  
Fax: +49 37 31 280 - 106  
E-mail: info@fcm-germany.com
- For information contact: Departments *Quality Assurance and Labour Safety*
- 1.4 Emergency contact: +49 361 73 07 30  
- Germany - Poison Information Centre Erfurt

## 2. Potential Hazards

- 2.1 Name of hazards:  
2.1.1 Classification

There is no evidence about a classification procedure for GaAs. GaAs is not named in annex I of the **67/548/EWG** directive. **The substance is not subject to the EC directive RL: 1999/45/EC.**  
The classification as given in the following tables refers to arsenic and its compounds which are not particularly named in the annex of above directions.

Regulation (EC) No. 1272/2008		
Hazard class/category	Hazard reference	Remarks
Acute toxicity (oral), hazard category 3	H301	Toxic when ingested
Acute toxicity (inhalation), hazard category 3	H331	Toxic when inhaled
Chronically hazardous to water, hazard category 1	H400	Highly toxic for water organisms
Chronically hazardous to water, hazard category 2	H410	Highly toxic for water organisms with long-term effect

67/548/EWG oder 1999/45/EC	
Hazard characteristics	R-rates
Toxic when inhaled or digested	23/25
Very toxic for water organisms, may cause long-term adverse effects on water	50/53

- 2.1.2 Additional information

**Arsenic compounds**, in particular **diarsenic trioxide** and **arsenic hydride**, which may result from **thermal decomposition and /or chemical reactions of GaAs**, are considered **toxic**.

Poisoning by these arsenic compounds may cause irritation of skin and mucous membranes; may damage heart, liver, blood, nerves and metabolism. **Arsenic** is released during chemical decomposition of GaAs in absence of oxygen. Arsenic compounds rank among the carcinogen substances. There is a risk of poisoning by inhalation and ingestion of dust and fog when handling the substance.

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## 3. Composition / Information on Ingredients

3.1	Information on substance:	
	Chemical characterization:	Gallium arsenide (GaAs)
	CAS - No.:	1303 - 00 - 0
	EC-No.	215-114-8
	Index No.:	033 - 002 - 00 – 5
	Purity:	99,999 %
	Stabilising agents:	none
	Hazardous impurities:	none

## 4. First Aid Measures

4.1	After skin contact:	Wash with water and soap.
4.2	After eye contact:	Rinse with plenty of water, get medical attention.
4.3	After ingestion:	Get medical attention immediately. <b>Present Material Safety Data Sheet.</b>
4.4	After inhalation:	Remove person from exposure area to fresh air, immediate medical attendance required.

Regulatory information in situ: Information sheet M 008 (ZH 1/236) „Arsenic and its compounds“

## 5. Fire Fighting Measures

5.1	General:	Gallium arsenide is not combustible. It decomposes at high temperatures.
5.2	Suitable extinguishing agents:	Special extinguishing agents are not required. Adjust extinguishing measures to environment.
5.3	Unsuitable extinguishing agents due to safety reasons:	No exception
5.4	Special hazards caused by combustion products or emerging gases:	Arsenic oxide containing combustion gases and decomposition products may be generated
5.5	Special protection for fire fighting:	Respiratory protection because of As <sub>2</sub> O <sub>3</sub>

## 6. Accidental Release Measures

6.1	Personal protection:	Take precaution during mechanical processes (dust formation) and chemical reactions. Provide good ventilation in manufacturing spaces and exhausts for machines; avoid skin contact.
6.2	Environmental protection:	Do not drain-off fine-grained GaAs (suspensions) and liquid products of chemical reactions to the sewerage system.
6.3	Removal:	<ul style="list-style-type: none"><li>- use pulp</li><li>- use special vacuum cleaner</li><li>- dispose of contaminated cleaning auxiliaries pursuant to legal regulations</li></ul>

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## 7. Handling and Storage

- 7.1 Handling, measures providing safe handling: Avoid formation of dust, (see #. 6.1 and 10.1 through 10.4)
- 7.2 Storage, requirements to storage spaces, containers and conditions: Keep substance dry, close container, packaging material: PE foil, PE/PP containers, break-proof outer packaging

**Packaging materials or their components are not subject to 76/769/EWG directions.**

- 7.3 Storage class: **13 (non-combustible solid)**

## 8. Exposure Limitations and Personal Protective Equipment

- 8.1 Design of technical equipment: Provide exhausts/covers for equipment and machines where dust and gaseous arsenic compounds may be generated.
- 8.2 Substances for which apply limit values at workplaces:
- |          |                    |              |                        |
|----------|--------------------|--------------|------------------------|
| Germany: | diarsenic trioxide | TRK value    | 0.1 mg/m <sup>3</sup>  |
|          | arsine             | MAK value    | 0.05 ml/m <sup>3</sup> |
| USA:     | arsenic            | OSHA PEL TWA | 0.01 mg/m <sup>3</sup> |
- Measuring methods: Germany: method according to Employers' Liability Insurance Association of the Chemical Industry Preventive medical examinations **G 16**
- 8.3 Personal protective equipment: Avoid skin contact, do not eat, drink, smoke during work, do not keep food in working space, wear appropriate working clothes, change soiled clothing, wash hands after work.
- Respiratory protection: Depending on workplace full or half facepiece respirator  
dusts: particle filter P3 (recognition colour white)  
vapours/gases: gas filter type B (recognition colour grey)
- Hand protection: Protective gloves
- Tested glove material:
- 100 % nitrile polymer (0.1 mm tick) – clean room fit
  - natural latex (0.5 mm thick)
- Penetration time of glove material: Depends on mechanical exposure and additional chemical exposure.
- Protective gloves should be replaced at first signs of wear.**
- Eye protection: Depending on workplace (protective glasses, full facepiece mask only in case of dusts, vapours)
- Body protection: Depending on workplace (coat, suit, overall)

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## 9. Physical and Chemical Properties

- 9.1 Appearance: Form: solid substance (ingots and wafers)  
Colour: grey, metallic bright  
odour: none
- 9.2 pH (at ..... g/l): not applicable
- 9.3 Physical and safety data:  
Melting point /melting area: 1,238 °C  
Thermal decomposition: traces, starting at approx. 300 °C  
Flash point/flammability: not applicable  
Explosion risk/limits: not applicable  
Fire promoting properties: not applicable  
Vapour pressure: not applicable  
Density (at 300 K): 5,315 g/cm<sup>3</sup>  
Solubility: not soluble in water  
not soluble in common organic solvents
- 9.4 Other information: Forms with moisture in presence of air oxygen a very thin ( $d \leq 1 \times 10^{-9}$  m) water soluble toxic arsenic oxide layer

## 10. Stability and Reactivity

- 10.1 Conditions to avoid: Heating up in air outside closed equipment
- 10.2 Substances to avoid: Acids, lyes
- 10.3 Hazardous decomposition products: Thermal decomposition releases arsenic, in contact with air As<sub>2</sub>O<sub>3</sub>.
- 10.4 Hazardous reactions: Chemical reactions may release toxic arsenical compounds; dissolution in acids may release arsine if hydrogen is generated at the same time.

## 11. Toxicological Information

- 11.1 Toxicological impact on health: Gallium arsenide is considered as acutely non-toxic.  
Animal tox. (for GaAs):  
LD50 (mouse) = 4,700 mg/kg (intraperitoneal)  
LD30 (rat) = 10 g/kg (intraperitoneal)  
LD50 (rat) = 10 g/kg (oral, dermatological)
- That means:  
Classification criteria for hazardous substances do not apply. There is no evidence that inhalation, ingestion of or skin contact with gallium arsenide (compound semiconductor) has an acute toxicological impact on health.
- For other inorganic arsenic compounds applies:  
After inhalation: The threshold of response of human beings to arsenic compounds (relating to As in total dust) is:  
TRK (Technical Guide Concentration) = 0.1 mg/m<sup>3</sup>;  
this may cause inflammation of mucous membranes in respiratory tract.

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- After ingestion: Ingestion of arsenic compounds of 50 µg/kg/day causes disturbances of digestive tract and kidneys, changes of blood, irritation of skin etc.
- After skin contact: Arsenic compounds may cause inflammation of skin.
- 11.2 Chronic effect: Arsenic compounds may cause cancer of lungs and skin in human beings. There is no evidence as to such chronic effects caused by gallium arsenide (compound semiconductors).

### 12. Ecological Information

- 12.1 Mobility in respective environmental spheres: Not known.
- 12.2 Persistence and degradability: Gallium arsenide is not degradable.
- 12.3 Biological accumulation (food chain): Not known.
- 12.4 Ecological toxicity: Currently no assessment available.

### 13. Disposal Information

- 13.1 Product To be treated as hazardous waste according to effective legal regulations. Return to manufacturer possible upon agreement.
- 13.2 Soiled package: Special package for GaAs wafers see #. 7.2; package may be reused after cleaning or returned to GaAs wafer supplier or is to be disposed of according to legal regulations.

### 14. Transport Information

- 14.1 Classification: **UN - No. - not assigned**
- Transport classifications: Not applicable  
(ADR/RID; GGVS/GGVE; ADN/ADNR; IMDG/GGVSee; ICAO-TI, IATA-DGR)
- 14.2 Transport specifics: There are no specific traffic regulations since gallium arsenide is not hazardous under normal transport conditions (exposure to fire and chemicals excluded). This applies also if product is released from packaging in an accident.

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## 15. Regulatory Information

### 15.1 EC regulations

Marking (EC regulation No. 1272/2008)

Hazardous ingredients relevant for labelling: Arsenic and its compounds\*)

Signal word: Danger!



Danger pictograms:

Danger notice: H301, H331 (see. #. 2 )

Signal word: Warning!



Danger pictogram:

Danger notice: H400, H410 (see #. 2)

Security advice: P261 Avoid inhalation of dust  
P270 Do not eat or drink when working with this product  
P273 Avoid release into environment

\*) The manufacturer (FCM) has deliberately chosen this labelling because of the oxide layer on the surface, **although** the share of  $As_2O_3$  in GaAs ingots and wafers **is clearly below** the defined **threshold that classifies substances as toxic; hence there is only a minimum of potential hazards** (see # 9.4).

### 15.2 National regulations:

Employment restrictions: Observe restrictions as to employment of adolescent persons.  
To be used by technically qualified staff only.

Classification as per German Health and Safety Regulations (BetrSichV): ---

Water hazard class: WGK 3 (self classification): highly hazardous to waters.  
WGK 3 applies to the water soluble arsenic oxide formed on the surface in the presence of moisture.

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ABOVE INFORMATION IS BASED ON OUR PRESENT KNOWLEDGE AND EXPERIENCE. THE SAFETY DATA SHEET DESCRIBES OUR PRODUCTS WITH REGARD TO SAFETY REQUIREMENTS BUT DOES NOT GUARANTEE PROPERTIES. THE BUYER OF OUR PRODUCTS IS SOLELY RESPONSIBLE FOR OBSERVING APPLICABLE LAWS AND REGULATIONS.

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