

**SAFETY DATA SHEET**  
**Zinc Gallium Oxide (pieces)**

According to Appendix D, OSHA Hazard Communication Standard 29 CFR §1910.1200

**1. Identification**

**Product identifier**

**Product name** Zinc Gallium Oxide (pieces)

**Internal identification** Replaces M-3000-203

**Recommended use of the chemical and restrictions on use**

**Application** Physical vapor deposition of thin films

**Uses advised against** This product is designed for use by technically competent persons. Any use of this product, other than for its stated use, should not be attempted without expert review.

**Details of the supplier of the safety data sheet**

**Supplier** Stanford Advanced Materials

**Manufacturer** Stanford Advanced Materials  
23661 Birtcher Dr.,  
Lake Forest, CA 92630 U.S.A.  
Tel: (949) 407-8904  
Fax: (949) 812-6690

**Emergency telephone number** (949) 407-8904  
**Emergency telephone** (This telephone number is available 24 hours per day, 7 days per week.)

**2. Hazard(s) identification**

**Classification of the substance or mixture**

**Physical hazards** Not Classified

**Health hazards** Not Classified

**Environmental hazards** Aquatic Acute 1 - H400 Aquatic Chronic 1 - H410

**Label elements**

**Pictogram**





# Zinc Gallium Oxide (pieces)

## Indication of immediate medical attention and special treatment needed

**Notes for the doctor** Treat symptomatically.

## 5. Fire-fighting measures

### Extinguishing media

**Suitable extinguishing media** The product is not flammable. Extinguish with alcohol-resistant foam, carbon dioxide, dry powder or water fog. Use fire-extinguishing media suitable for the surrounding fire.

**Unsuitable extinguishing media** Do not use water jet as an extinguisher, as this will spread the fire.

### Special hazards arising from the substance or mixture

**Specific hazards** None known.

**Hazardous combustion products** Thermal decomposition or combustion products may include the following substances: Harmful gases or vapors.

### Advice for firefighters

**Protective actions during firefighting** Avoid breathing fire gases or vapors. Evacuate area. Cool containers exposed to heat with water spray and remove them from the fire area if it can be done without risk. Cool containers exposed to flames with water until well after the fire is out. Avoid discharge to the aquatic environment. Control run-off water by containing and keeping it out of sewers and watercourses. If risk of water pollution occurs, notify appropriate authorities.

**Special protective equipment for firefighters** Wear positive-pressure self-contained breathing apparatus (SCBA) and appropriate protective clothing. Standard Firefighter's clothing including helmets, protective boots and gloves will provide a basic level of protection for chemical incidents.

## 6. Accidental release measures

### Personal precautions, protective equipment and emergency procedures

**Personal precautions** Wear protective clothing as described in Section 8 of this safety data sheet. No action shall be taken without appropriate training or involving any personal risk.

### Environmental precautions

**Environmental precautions** Avoid discharge into drains or watercourses or onto the ground. Avoid discharge to the aquatic environment.

### Methods and material for containment and cleaning up

**Methods for cleaning up** Wear protective clothing as described in Section 8 of this safety data sheet. Clear up spills immediately and dispose of waste safely. Collect spillage with a shovel and broom, or similar and reuse, if possible. Collect and place in suitable waste disposal containers and seal securely. Flush contaminated area with plenty of water. Wash thoroughly after dealing with a spillage. Dangerous for the environment. Do not empty into drains. For waste disposal, see Section 13.

**Reference to other sections** For personal protection, see Section 8. See Section 11 for additional information on health hazards. See Section 12 for additional information on ecological hazards. For waste disposal, see Section 13.

## 7. Handling and storage

### Precautions for safe handling

**Usage precautions** Read and follow manufacturer's recommendations. Wear protective clothing as described in Section 8 of this safety data sheet. Keep away from food, drink and animal feeding stuffs. Keep container tightly sealed when not in use. Avoid discharge to the aquatic environment. Do not handle until all safety precautions have been read and understood. Do not handle broken packages without protective equipment. Do not reuse empty containers.

# Zinc Gallium Oxide (pieces)

**Advice on general occupational hygiene** Wash promptly if skin becomes contaminated. Take off contaminated clothing and wash before reuse. Wash contaminated clothing before reuse.

## Conditions for safe storage, including any incompatibilities

**Storage precautions** Keep only in the original container. Keep container tightly closed, in a cool, well ventilated place. Keep containers upright. Protect containers from damage.

**Storage class** Miscellaneous hazardous material storage.

## Specific end uses(s)

**Specific end use(s)** The identified uses for this product are detailed in Section 1.2.

## 8. Exposure Controls/personal protection

### Control parameters

#### Occupational exposure limits

##### **Zinc Oxide (powder and pieces)**

Long-term exposure limit (8-hour TWA): OSHA 15 mg/m<sup>3</sup> total dust  
Long-term exposure limit (8-hour TWA): ACGIH 2 mg/m<sup>3</sup> respirable fraction  
Short-term exposure limit (15-minute): ACGIH 10 mg/m<sup>3</sup> respirable fraction  
Long-term exposure limit (8-hour TWA): OSHA 5 mg/m<sup>3</sup> fume  
Long-term exposure limit (8-hour TWA): OSHA 5 mg/m<sup>3</sup> respirable fraction

OSHA = Occupational Safety and Health Administration.  
ACGIH = American Conference of Governmental Industrial Hygienists.

#### Zinc Oxide (powder and pieces) (CAS: 1314-13-2)

**Immediate danger to life and health** 500 mg/m<sup>3</sup>

### Exposure controls

#### **Protective equipment**



**Appropriate engineering controls** Provide adequate ventilation. Observe any occupational exposure limits for the product or ingredients.

**Eye/face protection** Unless the assessment indicates a higher degree of protection is required, the following protection should be worn: Tight-fitting safety glasses.

**Hand protection** No specific hand protection recommended. Avoid contact with skin.

**Other skin and body protection** Wear appropriate clothing to prevent repeated or prolonged skin contact.

**Hygiene measures** Wash hands thoroughly after handling. Wash at the end of each work shift and before eating, smoking and using the toilet. Do not eat, drink or smoke when using this product.

**Respiratory protection** Ensure all respiratory protective equipment is suitable for its intended use and is NIOSH approved. Check that the respirator fits tightly and the filter is changed regularly. Gas and combination filter cartridges should comply with OSHA 1910.134. Full face mask respirators with replaceable filter cartridges should comply with OSHA 1910.134. Half mask and quarter mask respirators with replaceable filter cartridges should comply with OSHA 1910.134.

**Environmental exposure controls** Keep container tightly sealed when not in use. Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

## Zinc Gallium Oxide (pieces)

### 9. Physical and Chemical Properties

#### Information on basic physical and chemical properties

Appearance	Solid.
Color	White/off-white.
Odor	No characteristic odor.
Odor threshold	Not applicable.
pH	Not applicable.
Melting point	Not available.
Initial boiling point and range	Not available.
Flash point	Not applicable.
Evaporation rate	Not applicable.
Flammability (solid, gas)	Not applicable.
Upper/lower flammability or explosive limits	Not applicable.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	>5.606 @ 25°C
Bulk density	Not available.
Solubility(ies)	Insoluble in water.
Partition coefficient	Not applicable.
Auto-ignition temperature	Not applicable.
Decomposition Temperature	Not available.
Viscosity	Not applicable.
Molecular weight	Not available.

### 10. Stability and reactivity

Reactivity	There are no known reactivity hazards associated with this product.
Stability	Stable at normal ambient temperatures and when used as recommended. Stable under the prescribed storage conditions.
Possibility of hazardous reactions	No potentially hazardous reactions known.
Conditions to avoid	There are no known conditions that are likely to result in a hazardous situation.
Materials to avoid	No specific material or group of materials is likely to react with the product to produce a hazardous situation.
Hazardous decomposition products	Does not decompose when used and stored as recommended. Thermal decomposition or combustion products may include the following substances: Harmful gases or vapors.

### 11. Toxicological information

#### Information on toxicological effects

## Zinc Gallium Oxide (pieces)

### Acute toxicity - oral

**Notes (oral LD<sub>50</sub>)** Based on available data the classification criteria are not met.

### Acute toxicity - dermal

**Notes (dermal LD<sub>50</sub>)** Based on available data the classification criteria are not met.

### Acute toxicity - inhalation

**Notes (inhalation LC<sub>50</sub>)** Based on available data the classification criteria are not met.

### Skin corrosion/irritation

**Animal data** Based on available data the classification criteria are not met.

### Serious eye damage/irritation

**Serious eye damage/irritation** Based on available data the classification criteria are not met.

### Respiratory sensitization

**Respiratory sensitization** Based on available data the classification criteria are not met.

### Skin sensitization

**Skin sensitization** Based on available data the classification criteria are not met.

### Germ cell mutagenicity

**Genotoxicity - in vitro** Based on available data the classification criteria are not met.

### Carcinogenicity

**Carcinogenicity** Based on available data the classification criteria are not met.

### IARC carcinogenicity

None of the ingredients are listed or exempt.

### Reproductive toxicity

**Reproductive toxicity - fertility** Based on available data the classification criteria are not met.

**Reproductive toxicity - development**

Based on available data the classification criteria are not met.

### Specific target organ toxicity - single exposure

**STOT - single exposure** Not classified as a specific target organ toxicant after a single exposure.

### Specific target organ toxicity - repeated exposure

**STOT - repeated exposure** Not classified as a specific target organ toxicant after repeated exposure.

### Aspiration hazard

**Aspiration hazard** Not relevant. Solid.

### General information

The severity of the symptoms described will vary dependent on the concentration and the length of exposure.

#### **Inhalation**

No specific symptoms known.

#### **Ingestion**

No specific symptoms known.

#### **Skin Contact**

Prolonged contact may cause dryness of the skin.

#### **Eye contact**

No specific symptoms known.

#### **Route of entry**

Ingestion Inhalation Skin and/or eye contact

#### **Target Organs**

No specific target organs known.

## 12. Ecological Information

### Toxicity

## Zinc Gallium Oxide (pieces)

**Toxicity** Aquatic Acute 1 - H400 Very toxic to aquatic life. Aquatic Chronic 1 - H410 Very toxic to aquatic life with long lasting effects.

### Persistence and degradability

**Persistence and degradability** The degradability of the product is not known.

### Bioaccumulative potential

**Bio-Accumulative Potential** No data available on bioaccumulation.

**Partition coefficient** Not applicable.

### Mobility in soil

**Mobility** No data available.

### Other adverse effects

**Other adverse effects** None known.

## 13. Disposal considerations

### Waste treatment methods

**General information** The generation of waste should be minimized or avoided wherever possible. Reuse or recycle products wherever possible. This material and its container must be disposed of in a safe way. When handling waste, the safety precautions applying to handling of the product should be considered. Care should be taken when handling emptied containers that have not been thoroughly cleaned or rinsed out. Empty containers or liners may retain some product residues and hence be potentially hazardous.

**Disposal methods** Dispose of surplus products and those that cannot be recycled via a licensed waste disposal contractor. Waste, residues, empty containers, discarded work clothes and contaminated cleaning materials should be collected in designated containers, labeled with their contents. Incineration or landfill should only be considered when recycling is not feasible.

## 14. Transport information

**General** The product is not covered by international regulations on the transport of dangerous goods (IMDG, IATA, DoT).

### UN Number

Not applicable.

### UN proper shipping name

Not applicable.

### Transport hazard class(es)

No transport warning sign required.

### Packing group

Not applicable.

### Environmental hazards

#### **Environmentally Hazardous Substance**

No.

### Special precautions for user

Based on available knowledge of this material, it has been determined to be non-hazardous and will not pose a risk to persons or the environment in its provided form. However, any cutting, welding, melting, grinding, or use for deposition will produce dust, fume, or particulates containing component elements of this material. Exposure to these components may present significant health hazards. Note: Fine particulate may be a combustible dust which, when dispersed in air, may present an explosion hazard.

# Zinc Gallium Oxide (pieces)

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable.

## 15. Regulatory information

### US Federal Regulations

#### **SARA Section 302 Extremely Hazardous Substances Tier II Threshold Planning Quantities**

None of the ingredients are listed or exempt.

#### **CERCLA/Superfund, Hazardous Substances/Reportable Quantities (EPA)**

None of the ingredients are listed or exempt.

#### **SARA Extremely Hazardous Substances EPCRA Reportable Quantities**

None of the ingredients are listed or exempt.

#### **SARA 313 Emission Reporting**

Yes

#### **CAA Accidental Release Prevention**

None of the ingredients are listed or exempt.

#### **FDA - Essential Chemical**

None of the ingredients are listed or exempt.

#### **FDA - Precursor Chemical**

None of the ingredients are listed or exempt.

#### **SARA (311/312) Hazard Categories**

None of the ingredients are listed or exempt.

#### **OSHA Highly Hazardous Chemicals**

None of the ingredients are listed or exempt.

### US State Regulations

#### **California Proposition 65 Carcinogens and Reproductive Toxins**

None of the ingredients are listed or exempt.

#### **California Air Toxics "Hot Spots" (A-I)**

None of the ingredients are listed or exempt.

#### **California Air Toxics "Hot Spots" (A-II)**

None of the ingredients are listed or exempt.

#### **California Directors List of Hazardous Substances**

None of the ingredients are listed or exempt.

#### **Massachusetts "Right To Know" List**

Some of the ingredients are listed or exempt.

#### **Rhode Island "Right To Know" List**

Some of the ingredients are listed or exempt.

#### **Minnesota "Right To Know" List**

None of the ingredients are listed or exempt.

#### **New Jersey "Right To Know" List**

Some of the ingredients are listed or exempt.



# Zinc Gallium Oxide (pieces)

## Pennsylvania "Right To Know" List

Some of the ingredients are listed or exempt.

## Inventories

### EU - EINECS/ELINCS

All the ingredients are listed or exempt.

### Canada - DSL/NDSL

All the ingredients are listed or exempt.

### US - TSCA

All the ingredients are listed or exempt.

### US - TSCA 12(b) Export Notification

None of the ingredients are listed or exempt.

### Australia - AICS

All the ingredients are listed or exempt.

### Japan - MITI

All the ingredients are listed or exempt.

### Korea - KECI

All the ingredients are listed or exempt.

### China - IECSC

All the ingredients are listed or exempt.

### Philippines - PICCS

All the ingredients are listed or exempt.

### New Zealand - NZIOC

All the ingredients are listed or exempt.

## 16. Other information

<b>Training advice</b>	Only trained personnel should use this material.
<b>SDS No.</b>	4973
<b>Hazard statements in full</b>	H400 Very toxic to aquatic life. H410 Very toxic to aquatic life with long lasting effects.

**End of SDS**

This information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Such information is, to the best of the company's knowledge and belief, accurate and reliable as of the date indicated. However, no warranty, guarantee or representation is made to its accuracy, reliability or completeness. It is the user's responsibility to satisfy himself as to the suitability of such information for his own particular use.