1. Identification

1.1. Product identifier

Product Identity: Vanadium Pentoxide (V₂O₅)
Alternate Names: Vanadium Pentoxide

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

Intended use: See Technical Data Sheet.
Application Method: See Technical Data Sheet.

1.3. Details of the supplier of the safety data sheet

Company Name: EVRAZ Stratcor, Inc.
4285 Malvern Road
Hot Springs, Arkansas 71901; U.S.A
(Company Identification)
Telephone: +1-501-262-1270
Fax: +1-501-262-2793
Website: www.evrazstratcor.com

Company Name: EVRAZ Stratcor, Inc.
200 Randolph Drive
Chicago, Illinois 60601; U.S.A
(Inquiry Department)
Telephone: +1-312-533-3650
Fax: +1-503-283-7391
Website: www.evrazstratcor.com

Emergency
24 hour Emergency Telephone No.
NATIONAL RESPONSE CENTER: +1-800-424-8802
CHEMTREC U.S. and CANADA: +1-800-424-9300
CHEMTREC International: +1-202-483-7616 (Collect)

2. Hazard(s) identification

2.1. Classification of the substance or mixture

Acute Tox. 4;H302 Harmful if swallowed.
Acute Tox. 4;H332 Harmful if inhaled.
Muta. 2;H341 Suspected of causing genetic defects.
Repr. 2;H361d Suspected of damaging the unborn child.
STOT SE 3;H335 May cause respiratory irritation.
STOT RE 1;H372 Causes damage to organs through prolonged or repeated exposure. Specific Target Organs: (Not Available)
Aquatic Chronic 2;H411 Toxic to aquatic life with long lasting effects.

2.2. Label elements

Using the Toxicity Data listed in section 11 and 12 the product is labeled as follows.

Signal Word: Danger

Hazard Statements:
H302 Harmful if swallowed.
H332 Harmful if inhaled.
H335 May cause respiratory irritation.
H341 Suspected of causing genetic defects.
H361d Suspected of damaging the unborn child.
H372 Causes damage to organs through prolonged or repeated exposure.
H411 Toxic to aquatic life with long lasting effects.

Precautionary Statements:
[Prevention]:
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P261 Avoid breathing dust / fume / gas / mist / vapors / spray.
P264 Wash thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P271 Use only outdoors or in a well-ventilated area.
P273 Avoid release to the environment.
P281 Use personal protective equipment as required.

P202 Do not handle until all safety precautions have been read and understood.
P261 Avoid breathing dust / fume / gas / mist / vapors / spray.
P264 Wash thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P271 Use only outdoors or in a well-ventilated area.
P273 Avoid release to the environment.
P281 Use personal protective equipment as required.

3. Composition/information on ingredients

This product contains the following substances that present a hazard within the meaning of the relevant State and Federal Hazardous Substances regulations.

<table>
<thead>
<tr>
<th>Ingredient/Chemical Designations</th>
<th>Weight %</th>
<th>GHS Classification</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vanadium pentoxide</td>
<td>&gt;99%</td>
<td>Muta. 2;H341</td>
<td>[1][2]</td>
</tr>
<tr>
<td>CAS Number: 0001314-62-1</td>
<td></td>
<td>Repr. 2;H361d</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>STOT RE 1;H372</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acute Tox. 4;H332</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acute Tox. 4;H302</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>STOT SE 3;H335</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aquatic Chronic 2;H411</td>
<td></td>
</tr>
</tbody>
</table>

In accordance with paragraph (i) of §1910.1200, the specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.
[1] Substance classified with a health or environmental hazard.
*The full texts of the phrases are shown in Section 16.

4. First aid measures

4.1. Description of first aid measures

General In all cases of doubt, or when symptoms persist, seek medical attention.
Never give anything by mouth to an unconscious person.

Inhalation Remove to fresh air, keep patient warm and at rest. If breathing is irregular or stopped, give artificial respiration. If unconscious place in the recovery position and obtain immediate medical attention. Give nothing by mouth.

Eyes Flush with water 15 minutes to remove particles. See an ophthalmologist.

Skin Remove contaminated clothing. Wash skin thoroughly with soap and water or use a recognized skin cleanser.

Ingestion Give two glasses of water. Induce vomiting if conscious. Call a physician.

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

Overview Eye Contact: Irritation with possible corneal injury.
Skin Contact: Irritation with reddening and itching. Absorption of harmful amounts possible.
Inhalation: Irritation of the respiratory tract, chest tightness, wheezing, bloody nose, and coughing.
Ingestion: Abdominal discomfort, nausea, vomiting, cramping. Harmless green tongue discoloration. EXTREME or repeated overexposure may cause chronic bronchitis, allergic skin reaction, or asthmatic reaction with
5. Fire-fighting measures

5.1. Extinguishing media
Not flammable. Use media suitable for surrounding fire.

5.2. Special hazards arising from the substance or mixture
Hazardous decomposition: No hazardous decomposition data available.
Avoid breathing dust / fume / gas / mist / vapors / spray.

5.3. Advice for fire-fighters
Full protective equipment including positive pressure-breathing apparatus. (See DOT Guide 151.)
Avoid creating dust.
ERG Guide No. 151

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Put on appropriate personal protective equipment (see section 8).

6.2. Environmental precautions
Do not allow spills to enter drains or waterways.
Use good personal hygiene practices. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse.

6.3. Methods and material for containment and cleaning up
Prevent entering sewage systems or surface water.
Vacuum preferred (or sweeping). Addition of sand or sweeping compound is advisable.
Avoid decontamination procedures which create airborne dusting. Use ventilation if necessary to control dusting.

7. Handling and storage

7.1. Precautions for safe handling
Avoid areas where dust is present.

7.2. Conditions for safe storage, including any incompatibilities
Keep dry and in closed containers.
Incompatible materials: Incompatible with aluminum powder.
See section 2 for further details. - [Storage]:

7.3. Specific end use(s)
No data available.

8. Exposure controls and personal protection

8.1. Control parameters

<table>
<thead>
<tr>
<th>Exposure</th>
<th>CAS No.</th>
<th>Ingredient</th>
<th>Source</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0001314-62-1</td>
<td>Vanadium pentoxide</td>
<td>OSHA</td>
<td>C 0.5 mg V2O5/m3 (resp)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ACGIH</td>
<td>TWA: 0.2 mg/m3 (Total Dust) 2B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NIOSH</td>
<td>Ceiling: 0.05 mg/m3 2B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Supplier</td>
<td>No Established Limit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[15-minute]</td>
</tr>
</tbody>
</table>

Vanadium Pentoxide (V₂O₅) r0
SDS Revision Date: 06/09/2015
Safety Data Sheet

Carcinogen Data

<table>
<thead>
<tr>
<th>CAS No.</th>
<th>Ingredient</th>
<th>Source</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001314-62-1</td>
<td>Vanadium pentoxide</td>
<td>OSHA</td>
<td>Select Carcinogen: No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NTP</td>
<td>Known: No; Suspected: No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IARC</td>
<td>Group 1: No; Group 2a: No; Group 2b: Yes; Group 3: No; Group 4: No;</td>
</tr>
</tbody>
</table>

8.2. Exposure controls

Respiratory: Use respirators approved by NIOSH/MSHA in dusty areas.

Eyes: Use goggles or safety glasses with side shields.

Skin: Use protective gloves and barrier creams.

Engineering Controls: Proper dust collection. Minimize dust during dumping operations.

Other Work Practices: Use good personal hygiene practices. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse.

See section 2 for further details. - [Prevention]:

9. Physical and chemical properties

Appearance: Yellow-Orange Solid Granules

Odor: No smell

Odor threshold: Not determined

pH: Not Measured

Melting point / freezing point: 690°C (1274°F)

Initial boiling point and boiling range: Not Measured

Flash Point: Not Measured

Evaporation rate (Ether = 1): Not Measured

Flammability (solid, gas): Not Applicable

Upper/lower flammability or explosive limits:

- Lower Explosive Limit: Not Measured
- Upper Explosive Limit: Not Measured

Vapor pressure (Pa): Essentially Zero

Vapor Density: Not Measured

Specific Gravity: Not Measured

Solubility in Water: 0.8g per 100cc (at 20°C)

Partition coefficient n-octanol/water (Log Kow): Not Measured

Auto-ignition temperature: Not Measured

Decomposition temperature: 1750°C (3182°F)

Viscosity (cSt): Not Measured

Oxidizing Properties: May act as a catalyst in certain chemical environments.

Bulk Density: 1.2 to 1.3 g/cm3 (75 to 80 lb/ft3)

9.2. Other information

No other relevant information.

10. Stability and reactivity

10.1. Reactivity

Hazardous Polymerization will not occur.

10.2. Chemical stability

Stable under normal circumstances.

10.3. Possibility of hazardous reactions

No data available.

10.4. Conditions to avoid

Avoid any situations which cause dusting.

10.5. Incompatible materials
Incompatible with aluminum powder.

10.6. Hazardous decomposition products
No hazardous decomposition data available.

11. Toxicological information

Acute toxicity

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Oral LD50, mg/kg</th>
<th>Skin LD50, mg/kg</th>
<th>Inhalation Vapor LC50, mg/L/4hr</th>
<th>Inhalation Dust/Mist LC50, mg/L/4hr</th>
<th>Inhalation Gas LC50, ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vanadium pentoxide - (1314-62-1)</td>
<td>10 mg/kg oral-rat</td>
<td>No data available</td>
<td>No data available</td>
<td>No data available</td>
<td>No data available</td>
</tr>
</tbody>
</table>

Note: When no route specific LD50 data is available for an acute toxin, the converted acute toxicity point estimate was used in the calculation of the product's ATE (Acute Toxicity Estimate).

Classification | Category | Hazard Description
--- | --- | ---
Acute toxicity (oral) | 4 | Harmful if swallowed.
Acute toxicity (dermal) | --- | Not Applicable
Acute toxicity (inhalation) | 4 | Harmful if inhaled.
Skin corrosion/irritation | --- | Not Applicable
Serious eye damage/irritation | --- | Not Applicable
Respiratory sensitization | --- | Not Applicable
Skin sensitization | --- | Not Applicable
Germ cell mutagenicity | 2 | Suspected of causing genetic defects.
Carcinogenicity | --- | Not Applicable
Reproductive toxicity | 2 | Suspected of damaging the unborn child.
STOT-single exposure | 3 | May cause respiratory irritation.
STOT-repeated exposure | 1 | Causes damage to organs through prolonged or repeated exposure.
Aspiration hazard | --- | Not Applicable

12. Ecological information

12.1. Toxicity
Toxic to aquatic life with long lasting effects.
No additional information provided for this product. See Section 3 for chemical specific data.

Aquatic Ecotoxicity

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>96 hr LC50 fish, mg/l</th>
<th>48 hr EC50 crustacea, mg/l</th>
<th>ErC50 algae, mg/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vanadium pentoxide - (1314-62-1)</td>
<td>Not Available</td>
<td>Not Available</td>
<td>Not Available</td>
</tr>
</tbody>
</table>

12.2. Persistence and degradability
Does not readily deteriorate in the environment.

12.3. Bioaccumulative potential
Not Measured

12.4. Mobility in soil
No data available.

12.5. Results of PBT and vPvB assessment
This product contains no PBT/vPvB chemicals.

12.6. Other adverse effects
13. Disposal considerations

13.1. Waste treatment methods
Listed as an acutely hazardous waste when discarded.
U.S. EPA classifies discarded product, non-RcRA empty containers and liners, or spill residue as P119 waste.

14. Transport information

<table>
<thead>
<tr>
<th>DOT (Domestic Surface Transportation)</th>
<th>IMO / IMDG (Ocean Transportation)</th>
<th>ICAO/IATA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>14.1. UN number</strong></td>
<td>UN2862</td>
<td>UN2862</td>
</tr>
<tr>
<td><strong>14.2. UN proper shipping name</strong></td>
<td>UN2862, Vanadium pentoxide, non-fused form, 6.1, III</td>
<td>UN2862, Vanadium pentoxide, non-fused form</td>
</tr>
<tr>
<td><strong>14.3. Transport hazard class(es)</strong></td>
<td>DOT Hazard Class: 6.1</td>
<td>IMDG: 6.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sub Class: Not Applicable</td>
</tr>
<tr>
<td><strong>14.4. Packing group</strong></td>
<td>III</td>
<td>III</td>
</tr>
<tr>
<td><strong>14.5. Environmental hazards</strong></td>
<td>IMDG: Marine Pollutant: Yes (Vanadium oxide)</td>
<td></td>
</tr>
<tr>
<td><strong>14.6. Special precautions for user</strong></td>
<td>No further information</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15. Regulatory information

<table>
<thead>
<tr>
<th>Regulatory Overview</th>
<th>The regulatory data in Section 15 is not intended to be all-inclusive, only selected regulations are represented.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toxic Substance Control Act (TSCA)</td>
<td>All components of this material are either listed or exempt from listing on the TSCA Inventory.</td>
</tr>
<tr>
<td>WHMIS Classification</td>
<td>D2A</td>
</tr>
<tr>
<td>US EPA Tier II Hazards</td>
<td></td>
</tr>
<tr>
<td>Fire: No</td>
<td></td>
</tr>
<tr>
<td>Sudden Release of Pressure: No</td>
<td></td>
</tr>
<tr>
<td>Reactive: No</td>
<td></td>
</tr>
<tr>
<td>Immediate (Acute): Yes</td>
<td></td>
</tr>
<tr>
<td>Delayed (Chronic): Yes</td>
<td></td>
</tr>
</tbody>
</table>

EPCRA 311/312 Chemicals and RQs (lbs):
Vanadium pentoxide (1,000.00)

EPCRA 302 Extremely Hazardous:
Vanadium pentoxide

EPCRA 313 Toxic Chemicals:
Vanadium pentoxide

Proposition 65 - Carcinogens (>0.0%):
Vanadium pentoxide

Proposition 65 - Developmental Toxins (>0.0%):
To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

Proposition 65 - Female Repro Toxins (>0.0%):
To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

Proposition 65 - Male Repro Toxins (>0.0%):
To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

New Jersey RTK Substances (>1%):
Vanadium pentoxide

Pennsylvania RTK Substances (>1%):
Vanadium pentoxide
16. Other information

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to the information contained herein. We accept no responsibility and disclaim all liability for any harmful effects which may be caused by exposure to our products. Customers/users of this product must comply with all applicable health and safety laws, regulations, and orders.

The full text of the phrases appearing in section 3 is:

H302 Harmful if swallowed.
H332 Harmful if inhaled.
H335 May cause respiratory irritation.
H341 Suspected of causing genetic defects.
H361d Suspected of damaging the unborn child.
H372 Causes damage to organs through prolonged or repeated exposure.
H411 Toxic to aquatic life with long lasting effects.

This is the first version in the GHS SDS format. Listings of changes from previous versions in other formats are not applicable.

EVRAZ Stratcor, Inc. believes that the data on this sheet are correct as of the effective date and that the opinions given reflect those of qualified experts. Since EVRAZ Stratcor cannot control the product or its use, it is the user's responsibility to use the product safely. The data on this sheet apply only to products sold by corporate subsidiaries of EVRAZ Stratcor and may not apply to products sold by others.

End of Document