Section 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identifier

Product Code SAC029

Product Name Zirconium Oxynitrate Solution

UN/ID no 3098

Synonyms Zirconium Oxynitrate Solution: Zirconium Nitrate Oxide Solution, Zirconium Dinitrate Oxide Solution (Product #326)

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

Recommended Use Chemical intermediate

Uses advised against

1.3. Details of the supplier of the safety data sheet

Manufacturer ATI, 1000 Six PPG Place, Pittsburgh, PA 15222 USA

1.4. Emergency telephone number

Emergency Telephone Chemtrec: +1-703-741-5970

Section 2: HAZARDS IDENTIFICATION

This material is classified per Regulation (EC) No 1272/2008.

2.1. Classification of the substance or mixture

Regulation (EC) No 1272/2008

<table>
<thead>
<tr>
<th>Hazard Class</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute toxicity - Oral</td>
<td>Category 4</td>
</tr>
<tr>
<td>Skin corrosion/irritation</td>
<td>Category 1B</td>
</tr>
<tr>
<td>Serious eye damage/eye irritation</td>
<td>Category 1</td>
</tr>
<tr>
<td>Oxidising liquids</td>
<td>Category 2</td>
</tr>
</tbody>
</table>

2.2. Label elements

Danger

Hazard statements
H272 - May intensify fire; oxidiser
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H302 - Harmful if swallowed

Emergency Overview
Precautionary Statements - Prevention
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Store away from flammable substances, reducing agents, metal powders, and organic materials. Do not breathe gas/mist/vapours/spray. Wash hands thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary Statements - Response
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER or doctor/physician. IF ON SKIN (or hair): Rinse cautiously with water for several minutes. Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Wash contaminated clothing before reuse. In case of fire: Use Water spray, fog or regular foam for extinction.

Precautionary Statements - Storage
Store in corrosive resistant container

Precautionary Statements - Disposal
Dispose of contents/container to an approved waste disposal plant

2.3 Hazards not otherwise classified (HNOC)
Not applicable

Other Information

<table>
<thead>
<tr>
<th>Section 3: COMPOSITION/INFORMATION ON INGREDIENTS</th>
</tr>
</thead>
</table>

3.1 Substances
Synonyms
Zirconium Oxynitrate Solution: Zirconium Nitrate Oxide Solution, Zirconium Dinitrate Oxide Solution (Product #326).

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>EC No</th>
<th>CAS No</th>
<th>Weight-%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>231-791-2</td>
<td>7732-18-5</td>
<td>60</td>
</tr>
<tr>
<td>Zirconium Dinitrate Oxide</td>
<td>237-529-3</td>
<td>13826-66-9</td>
<td>40</td>
</tr>
</tbody>
</table>

Section 4: FIRST AID MEASURES

4.1. Description of first aid measures
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a doctor or poison control centre immediately.

Skin Contact
Wash off immediately with soap and plenty of water. Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.

Eye contact
Flush with water for 15 minutes. See a physician.

Ingestion
Do NOT induce vomiting. Have patient drink large quantities of water if able. Call Physician
4.2. Most important symptoms and effects, both acute and delayed

**Symptoms**
May cause acute gastrointestinal effects if swallowed. Contact with skin may cause skin burns. May cause breathing difficulties if inhaled.

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

**Note to doctors**
Treat symptomatically.

### Section 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

**Suitable extinguishing media**
Material is a strong oxidizer but is itself not flammable. Water spray or fog is preferred; if water not available use dry chemical, CO2 or regular foam.

**Unsuitable extinguishing media**
None

5.2. Special hazards arising from the substance or mixture

This is a strong oxidizer and will react vigorously or explosively with many materials including organic materials, such as wood and paper, and flammable metals.

**Hazardous combustion products**
Nitrogen oxide gases may cause respiratory and/or eye irritation.

5.3. Advice for firefighters

Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear.

### Section 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

**Personal precautions**
Use personal protective equipment as required.

**For emergency responders**
Use personal protective equipment as required. Follow Emergency Response Guidebook, Guide No. 140.

6.2. Environmental precautions

Collect spillage to prevent release to the environment.

6.3. Methods and material for containment and cleaning up

**Methods for containment**
Prevent further leakage or spillage if safe to do so.

**Methods for cleaning up**
Wash the spill location thoroughly with water. Respiratory protection may be needed. Skin and eye protection should be used during cleanup.

6.4. Reference to other sections

See Section 12: ECOLOGICAL INFORMATION.

### Section 7: HANDLING AND STORAGE

7.1. Precautions for safe handling
Advice on safe handling
Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation, especially in confined areas. This is a strong oxidizer and will react vigorously or explosively with many materials including organic materials, such as wood and paper, and flammable metals. Keep away from all ignition sources including heat, sparks, and flame. Prevent dust accumulations to minimise combustible dust hazard.

General Hygiene Considerations
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Conditions
Keep away from heat, sparks, flame and other sources of ignition (i.e., pilot lights, electric motors and static electricity). Keep in properly labelled containers. Keep in a dry, cool and well-ventilated place. Protect from direct sunlight. Containers may become pressurized. Handle and open container with care. Keep in corrosion resistant containers. Store away from flammable substances, reducing agents, metal powders, and organic materials.

Incompatible materials
Alcohols, phenols, and amines. Rubber, coatings, and some plastics.

7.3. Specific end use(s)

Risk Management Methods (RMM)
The information required is contained in this Safety Data Sheet.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>European Union</th>
<th>United Kingdom</th>
<th>France</th>
<th>Spain</th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water 7732-18-5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Zirconium Dinitrate Oxide 13826-66-9</td>
<td>TWA: 5 mg/m³</td>
<td>-</td>
<td>-</td>
<td>STEL: 10 mg/m³</td>
<td>TWA: 5 mg/m³</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Italy</th>
<th>Portugal</th>
<th>Netherlands</th>
<th>Finland</th>
<th>Denmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water 7732-18-5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Zirconium Dinitrate Oxide 13826-66-9</td>
<td>-</td>
<td>STEL: 10 mg/m³</td>
<td>TWA: 5 mg/m³</td>
<td>TWA: 1 mg/m³</td>
<td>TWA: 5 mg/m³</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Austria</th>
<th>Switzerland</th>
<th>Poland</th>
<th>Norway</th>
<th>Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water 7732-18-5</td>
<td>TWA: 5 mg/m³</td>
<td>STEL: 10 mg/m³</td>
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<td>TWA: 5 mg/m³</td>
<td>STEL: 10 mg/m³</td>
</tr>
</tbody>
</table>

Derived No Effect Level (DNEL) No DNELs are available for this product as a whole

Predicted No Effect Concentration (PNEC) No PNECs are available for this product as a whole.

8.2. Exposure controls

Engineering Controls Avoid generation of uncontrolled mist.

Personal protective equipment

Eye/face protection If a risk of eye injury or irritation is present, appropriate eye protection is recommended; for example, tight-fitting goggles, foam-lined safety glasses, face shield, or other protective equipment that shields the eyes.

Skin and body protection Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Respiratory protection When gases/mists/vapours are generated and if exposure limits are exceeded or irritation is experienced, proper approved respiratory protection should be worn. Positive-pressure
Environmental exposure controls

Section 6: ACCIDENTAL RELEASE MEASURES.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Remarks / Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Liquid</td>
<td></td>
</tr>
<tr>
<td>Appearance</td>
<td>Liquid</td>
<td></td>
</tr>
<tr>
<td>Colour</td>
<td>white, light brown</td>
<td>Odour</td>
</tr>
<tr>
<td>Odour threshold</td>
<td>Pungent; Slight nitric</td>
<td></td>
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<tr>
<td>pH</td>
<td>&lt;1</td>
<td></td>
</tr>
<tr>
<td>Melting point / freezing point</td>
<td>-15 °C / 5 °F</td>
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</tr>
<tr>
<td>Boiling point / boiling range</td>
<td>104 °C / 220 °F</td>
<td></td>
</tr>
<tr>
<td>Flash point</td>
<td>-</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Evaporation rate</td>
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<td></td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
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<td>Not flammable</td>
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<tr>
<td>Flammability Limit in Air</td>
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<td></td>
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<tr>
<td>Upper flammability limit</td>
<td>-</td>
<td></td>
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<tr>
<td>Lower flammability limit</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Vapour pressure</td>
<td>-</td>
<td>Not applicable</td>
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<tr>
<td>Vapour density</td>
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<td>Not applicable</td>
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<tr>
<td>Specific Gravity</td>
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<tr>
<td>Water solubility</td>
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<tr>
<td>Solubility(ies)</td>
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<td></td>
</tr>
<tr>
<td>Partition coefficient</td>
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<td></td>
</tr>
<tr>
<td>Autoignition temperature</td>
<td>-</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Kinematic viscosity</td>
<td>-</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Dynamic viscosity</td>
<td>-</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>-</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Oxidising properties</td>
<td>Strong oxidizer and will react vigorously or explosively with many materials including organic materials, such as wood and paper, and flammable metals.</td>
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</tr>
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<td>Odour threshold</td>
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<td></td>
</tr>
<tr>
<td>Property</td>
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<td></td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
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<td>Not flammable</td>
</tr>
<tr>
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<td>-</td>
<td>Not applicable</td>
</tr>
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<td>Water solubility</td>
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</tr>
<tr>
<td>Solubility(ies)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partition coefficient</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Autoignition temperature</td>
<td>-</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Kinematic viscosity</td>
<td>-</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Dynamic viscosity</td>
<td>-</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>-</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Oxidising properties</td>
<td>Strong oxidizer and will react vigorously or explosively with many materials including organic materials, such as wood and paper, and flammable metals.</td>
<td></td>
</tr>
</tbody>
</table>

9.2. Other information

- Softening point
- Molecular weight
- VOC Content (%)
- Not applicable
- Density
- Bulk density 12 lb/ft3

Section 10: STABILITY AND REACTIVITY

10.1. Reactivity

Strong oxidizer and will react vigorously or explosively with many materials including organic materials, such as wood and paper, and flammable metals.

10.2. Chemical stability

Stable under recommended storage conditions.

- Explosion data
  - Sensitivity to Mechanical Impact None.
  - Sensitivity to Static Discharge None.

10.3. Possibility of hazardous reactions
Hazardous polymerisation
Hazardous polymerisation does not occur.

Possibility of Hazardous Reactions
None under normal processing.

10.4. Conditions to avoid
To avoid thermal decomposition, do not overheat.

10.5. Incompatible materials
Alcohols, phenols, and amines. Rubber, coatings, and some plastics.

10.6. Hazardous decomposition products
Nitrogen oxide gases may cause respiratory and/or eye irritation. Thermal decomposition produces nitrogen oxide gas.

Section 11: TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Product Information

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Oral LD50</th>
<th>Dermal LD50</th>
<th>Inhalation LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Zirconium Dinitrate Oxide</td>
<td>&gt; 300 and &lt; 2000 mg/kg bw</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Information on toxicological effects

Symptoms
May cause acute gastrointestinal effects if swallowed. May cause skin burns. May cause severe upper respiratory irritation if inhaled. May cause burning sensation or redness in the eyes.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Acute toxicity
Harmful if swallowed.

Skin corrosion/irritation
Causes severe skin burns.

Serious eye damage/eye irritation
Causes severe eye damage.

Sensitisation
Product not classified.

Germ cell mutagenicity
Product not classified.

Carcinogenicity
Product not classified.

Reproductive toxicity
Product not classified.

STOT - single exposure
Product not classified.

STOT - repeated exposure
Product not classified.

Aspiration hazard
Product not classified.
Section 12: ECOLOGICAL INFORMATION

12.1. Toxicity

This product as shipped is not classified for aquatic toxicity

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Algae/aquatic plants</th>
<th>Fish</th>
<th>Toxicity to microorganisms</th>
<th>Crustacea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Zirconium Dinitrate Oxide</td>
<td>The 72 h EC50 of zirconium dichloride oxide to Pseudokirchnerella subcapitata was 80% v/v saturated solution.</td>
<td>The 96 h LL50 of zirconium dinitrate oxide to Oncorhynchus mykiss was greater than 100 mg/L.</td>
<td>-</td>
<td>The 48 h EC50 of zirconium dioxide to Daphnia magna was greater than 100 mg/L.</td>
</tr>
</tbody>
</table>

12.2. Persistence and degradability

12.3. Bioaccumulative potential

12.4. Mobility in soil

Mobility

12.5. Results of PBT and vPvB assessment

The PBT and vPb criteria do not apply to inorganic substances.

12.6. Other adverse effects

Section 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste from residues/unused products: Disposal should be in accordance with applicable regional, national and local laws and regulations.

Contaminated packaging: Disposal should be in accordance with applicable regional, national and local laws and regulations.

Section 14: TRANSPORT INFORMATION

IMDG

14.1 UN/ID no: 3098

14.2 Proper shipping name: Oxidizing Liquid, Corrosive, n.o.s. (Zirconium Oxynitrate)

14.3 Hazard Class: 5.1 (8)

14.4 Packing Group: II

14.5 Marine pollutant: Not applicable

14.6 Special Provisions: 62, IB1

14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code: Not applicable

RID

14.1 UN/ID no: 3098
14.2 Proper shipping name  Oxidizing Liquid, Corrosive, n.o.s. (Zirconium Oxynitrate)
14.3 Hazard Class  5.1 (8)
14.4 Packing Group  II
14.5 Environmental hazard  Not applicable
14.6 Special Provisions  62, IB1

ADR
14.1 UN/ID no  3098
14.2 Proper shipping name  Oxidizing Liquid, Corrosive, n.o.s. (Zirconium Oxynitrate)
14.3 Hazard Class  5.1 (8)
14.4 Packing Group  II
14.5 Environmental hazard  Not applicable
14.6 Special Provisions  62, IB1

ICAO (air)
14.1 UN/ID no  3098
14.2 Proper shipping name  Oxidizing Liquid, Corrosive, n.o.s. (Zirconium Oxynitrate)
14.3 Hazard Class  5.1 (8)
14.4 Packing Group  II
14.5 Environmental hazard  Not applicable
14.6 Special Provisions  62, IB1

IATA
14.1 UN/ID no  3098
14.2 Proper shipping name  Oxidizing Liquid, Corrosive, n.o.s. (Zirconium Oxynitrate)
14.3 Hazard Class  5.1 (8)
14.4 Packing Group  II
14.5 Environmental hazard  Not applicable
14.6 Special Provisions  62, IB1

Section 15: REGULATORY INFORMATION

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

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>French RG number</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>7732-18-5</td>
<td></td>
</tr>
<tr>
<td>Zirconium Dinitrate Oxide</td>
<td>13826-66-9</td>
<td></td>
</tr>
</tbody>
</table>

European Union

Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work

Authorisations and/or restrictions on use:
This product does not contain substances subject to authorisation (Regulation (EC) No. 1907/2006 (REACH), Annex XIV). This product does not contain substances subject to restriction (Regulation (EC) No. 1907/2006 (REACH), Annex XVII).

International Inventories

- DSL/NDSL  Complies
- EINECS/ELINCS  Complies
- ENCS  Complies
- IECSC  Complies
- KECL  Complies
- PICCS  Not Listed
- AICS  Not Listed

Legend:
TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
15.2. Chemical safety assessment

No chemical safety assessment has been performed for this product.

Section 16: OTHER INFORMATION

<table>
<thead>
<tr>
<th>Issue Date</th>
<th>14-Apr-2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revision Date</td>
<td>17-Dec-2019</td>
</tr>
<tr>
<td>Revision Note</td>
<td>Updated to comply with GHS.</td>
</tr>
</tbody>
</table>

This material safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006

Note:
The information provided in this Material Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The 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, unless specified in the text.

Additional information available from:
Safety data sheets and labels available at ATImetals.com

End of Safety Data Sheet