1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product Identifier
Chemical Name 1,4-Dioxane-\textsuperscript{13}C\textsubscript{4}

Catalogue # D485357

1.2 Relevant Identified Uses of the Substance or Mixture and Uses Advised Against
Product Uses To be used only for scientific research and development. Not for use in humans or animals.

1.3 Details of the Supplier of the Safety Data Sheet
Company Toronto Research Chemicals
2 Brisbane Road
Toronto, ON M3J 2J8
CANADA

Telephone +14166659696
FAX +14166654439
Email orders@trc-canada.com

1.4 Emergency Telephone Number
Emergency# +1(416) 665-9696 between 0800-1700 (GMT-5)

2. HAZARDS IDENTIFICATION

WHMIS Classification (Canada)
B2 Flammable Liquid

D2A Very Toxic Material Causing Other Toxic Effects
Carcinogen

D2B Toxic Material Causing Other Toxic Effects
Moderate Eye Irritant

2.1/2.2 Classification of the Substance or Mixture and Label Elements

GHS Hazards Classification (According to EU Regulation 1272/2008 and US OSHA 1910.1200)
Flammable Liquids (Category 2)
Serious Eye Irritation (Category 2A)
Carcinogenicity (Category 2)
Specific Target Organ Toxicity, Single Exposure; Respiratory Tract Irritation (Category 3)

GHS Hazards Identification (According to EU Regulation 1272/2008 and US OSHA 1910.1200)

Signal Word Danger

GHS Hazard Statements
H225 Highly flammable liquid and vapour.
H319 Causes serious eye irritation.
H351 Suspected of causing cancer.
H335 May cause respiratory irritation.
GHS Precautionary Statements
P210  Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
P261  Avoid breathing dust/fume/gas/mist/vapours/spray
P281  Use personal protective equipment as required.
P305/P351/P338  IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

2.3 Unclassified Hazards/Hazards Not Otherwise Classified
No data available.

3. COMPOSITION/INFORMATION ON INGREDIENTS
3.1 Substances
Molecular Formula: \(^{13}\text{C}_4\text{H}_8\text{O}_2\)  Molecular Weight: 92.08
CAS Registry #: 1228182-37-3  EC#:
Synonyms
p-Dioxane-\(^{13}\text{C}_4\); 1,4-Diethylene-\(^{13}\text{C}_4\) Dioxide; 1,4-Dioxacyclohexane-\(^{13}\text{C}_4\); 1,4-Dioxan-\(^{13}\text{C}_4\); Tetrahydro-1,4-dioxin-\(^{13}\text{C}_4\); Diethylene Dioxide-\(^{13}\text{C}\); Diethylene Ether-\(^{13}\text{C}\); Diethylene Oxide-\(^{13}\text{C}\); Dioxan-\(^{13}\text{C}\); Dioxane-\(^{13}\text{C}\); Dioxyethylene-\(^{13}\text{C}\) Ether; NE 220-\(^{13}\text{C}\); NSC 8728-\(^{13}\text{C}\); p-Dioxan-\(^{13}\text{C}\)

3.2 Mixtures
Not a mixture.

4. FIRST AID MEASURES
4.1 Description of First Aid Measures
General Advice
If medical attention is required, show this safety data sheet to the doctor.

If Inhaled
If inhaled, move person to fresh air. If not breathing, give artificial respiration and consult a physician.

In Case of Skin Contact
Wash affected area with soap and water. Consult a physician if any exposure symptoms are observed.

In Case of Eye Contact
Immediately rinse eyes with plenty of water for at least 15 minutes. Consult a physician.

If Swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Do NOT induce vomiting unless advised to do so by a physician or Poison Control Center. Seek medical attention.

4.2 Most Important Symptoms and Effects, Both Acute and Delayed
The most important known symptoms and effects are described in the labeling (see section 2.2) and/or section 11.

4.3 Indication of any Immediate Medical Attention and Special Treatment Needed
No data available.

5. FIREFIGHTING MEASURES
5.1 Extinguishing Media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special Hazards Arising from the Substance or Mixture
Carbon oxides

5.3 Advice for Firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further Information
No data available.

6. ACCIDENTAL RELEASE MEASURES
**Personal precautions**  
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

**Environmental precautions**  
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

**Method and materials for containment and cleaning up**  
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

### 7. HANDLING AND STORAGE

**Precautions for safe handling**  
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed.

**Conditions for safe storage**  
Keep container tightly closed in a dry and well-ventilated place.  
Keep in a dry place.

Storage conditions: No Data Available

**7.3 Specific End Uses**  
For scientific research and development only. Not for use in humans or animals.

### 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

#### 8.1 Control Parameters

**Components with workplace control parameters**

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,4-Dioxane-13C4</td>
<td>1228182-37-3</td>
<td>TWA</td>
<td>20.000000 ppm</td>
<td>Canada. British Columbia OEL</td>
</tr>
</tbody>
</table>

**Remarks**  
IARC '2B' applies to substances deemed possibly carcinogenic to humans. Contributes significantly to the overall exposure by the skin route.

| TWA                | 20.000000 ppm      | Canada. Ontario OELs |

**Skin**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>72.000000 mg/m³</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Substance may be readily absorbed through intact skin

<table>
<thead>
<tr>
<th>TWAEV</th>
<th>20.000000 ppm</th>
<th>Québec. Regulation respecting occupational health and safety, Schedule 1, Part 1: Permissible exposure values for airborne contaminants</th>
</tr>
</thead>
<tbody>
<tr>
<td>72.000000 mg/m³</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Skin (percutaneous)

Carcinogenic effect detected in animals. Results of studies relating to the carcinogenicity of these substances in animals are not necessarily applicable to humans.

<table>
<thead>
<tr>
<th>TWA</th>
<th>20.000000 ppm</th>
<th>USA. ACGIH Threshold Limit Values (TLV)</th>
</tr>
</thead>
</table>

#### 8.2 Exposure Controls

**Appropriate Engineering Controls**

A laboratory fume hood or other appropriate form of local exhaust ventilation should be used to avoid exposure.

**Personal Protective Equipment**

All recommendations below are advisory in nature and a risk assessment should be performed by the employer/end user prior to use of this product. The type of protective equipment must be selected based on the amount and concentration of the dangerous material being used in the workplace.

**Eye/Face Protection**
Safety glasses or safety goggles. All equipment should have been tested and approved under appropriate standards, such as NIOSH (US), CSA (Canada), or EN 166 (EU).

**Skin Protection**
Gloves should be used when handling this material. Gloves are to be inspected prior to use. Contaminated gloves are to be removed using proper glove removal technique so that the outer surface of the glove does not contact bare skin. Dispose of contaminated gloves after use in compliance with good laboratory practices and local requirements.

Gloves used for incidental exposures (splash protection) should be designated as “low chemical resistant” or “waterproof” by EU standard EN 374. Unrated gloves are not recommended.
Suggested gloves: AnsellPro nitrile gloves style 92-500 or 92-600, 5 mil thickness.
Penetration time has not been determined.

Gloves used for prolonged direct exposure (immersion) should be designated “chemical resistant” as per EN 734 with the resistance codes corresponding to the anticipated use of the material.
Penetration time has not been determined.

These recommendations may not apply if the material is mixed with any other chemical, or dissolved into a solution. A risk assessment must be performed to ensure the gloves will still offer acceptable protection.

**Body Protection**
Fire resistant (Nomex) lab coat or coveralls.

**Respiratory Protection**
Recommended respirators are NIOSH-approved OV/Multi-Gas/P95 or CEN-approved ABEK-P2 respirators. These are to be only used as a backup to local exhaust ventilation or other engineering controls. If the respirator is the only means of protection, a full-face supplied air respirator must be used.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

**9.1 Information on Basic Physical and Chemical Properties**

<table>
<thead>
<tr>
<th>A) Appearance</th>
<th>B) Odour</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Data Available</td>
<td>No data available</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C) Odour Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>No data available</td>
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<table>
<thead>
<tr>
<th>D) pH</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>E) Melting Point/Freezing Point</th>
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</thead>
<tbody>
<tr>
<td>No Data Available</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>F) Initial Boiling Point/Boiling Range</th>
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</thead>
<tbody>
<tr>
<td>No data available</td>
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</table>

<table>
<thead>
<tr>
<th>G) Flash point</th>
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</thead>
<tbody>
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<table>
<thead>
<tr>
<th>H) Evaporation Rate</th>
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</thead>
<tbody>
<tr>
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</table>

<table>
<thead>
<tr>
<th>I) Flammability (Solid/Gas)</th>
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</thead>
<tbody>
<tr>
<td>No data available</td>
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</table>

<table>
<thead>
<tr>
<th>J) Upper/Lower Flammability/Explosive Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>No data available</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>K) Vapour Pressure</th>
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<tbody>
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</table>

<table>
<thead>
<tr>
<th>L) Vapour Density</th>
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</thead>
<tbody>
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<td>No data available</td>
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</table>

<table>
<thead>
<tr>
<th>M) Relative Density</th>
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</thead>
<tbody>
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<table>
<thead>
<tr>
<th>N) Solubility</th>
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</thead>
<tbody>
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<td>No Data Available</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>O) Partition Coefficient: n-octanol/water</th>
</tr>
</thead>
<tbody>
<tr>
<td>No data available</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>P) Auto-Ignition Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>No data available</td>
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</table>

<table>
<thead>
<tr>
<th>Q) Decomposition Temperature</th>
</tr>
</thead>
<tbody>
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<table>
<thead>
<tr>
<th>R) Viscosity</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

<table>
<thead>
<tr>
<th>S) Explosive Properties</th>
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</thead>
<tbody>
<tr>
<td>No data available</td>
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</table>

<table>
<thead>
<tr>
<th>T) Oxidizing Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>No data available</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>9.2 Other Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>no data available</td>
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</table>

**10. STABILITY AND REACTIVITY**

<table>
<thead>
<tr>
<th>10.1 Reactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>No data available</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>10.2 Chemical Stability</th>
</tr>
</thead>
<tbody>
<tr>
<td>No data available</td>
</tr>
</tbody>
</table>
10.3 Possibility of Hazardous Reactions
Vapours may form explosive mixture with air.

10.4 Conditions to Avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible Materials
No data available.

10.6 Hazardous Decomposition Products
In the event of fire: See section 5. Other decomposition products: No data available.

11. TOXICOLOGICAL INFORMATION

11.1 Information on Toxicological Effects

A) Acute Toxicity
   Oral LD50: No data available. Inhalation LC50: No data available.
   Dermal LD50: No data available.

B) Skin Corrosion/Irritation
   No data available

C) Serious Eye Damage/Irritation
   Moderate eye irritant.

D) Respiratory or Skin Sensitization
   No data available

E) Germ Cell Mutagenicity
   No data available

F) Carcinogenicity
   Evidence of a carcinogenic effect.
   This compound has been designated by the IARC as Group 2B: Possibly carcinogenic to humans.

G) Reproductive Toxicity/Teratogenicity
   No data available

H) Single Target Organ Toxicity - Single Exposure
   Moderate respiratory tract irritation.

I) Single Target Organ Toxicity - Repeated Exposure
   No data available

J) Aspiration Hazard
   No data available

K) Potential Health Effects and Routes of Exposure
   Inhalation
      May be harmful if inhaled. Causes respiratory tract irritation.
   Ingestion
      May be harmful if swallowed.
   Skin
      May be harmful if absorbed through skin. May cause skin irritation.
   Eyes
      Causes eye irritation.

L) Signs and Symptoms of Exposure
   The most important known symptoms and effects are described in the labeling (see section 2.2) and/or section 11.

   To the best of our knowledge, the chemical, physical, and toxicological properties of this material have not been thoroughly investigated.

M) Additional Information
   RTECS: JG8225000

12. ECOLOGICAL INFORMATION

12.1 Toxictiy
   No data available.

12.2 Persistence and Degradability

This Safety Data Sheet contains 16 sections. All 16 sections must be present for this document to be valid.
12.3 Bioaccumulative Potential
No data available.

12.4 Mobility in Soil
No data available.

12.5 Results of PBT and vPvB Assessment
No data available.

12.6 Other Adverse Effects
No data available.

13. DISPOSAL CONSIDERATIONS

13.1 Waste Treatment Methods
A) Product
Product may be burned in an incinerator equipped with afterburner and scrubber. Excess and expired materials are to be offered to a licensed hazardous material disposal company. Ensure that all Federal and Local regulations regarding the disposal and destruction of this material are followed.

B) Contaminated Packaging
Dispose of as above.

C) Other Considerations
Product is not to be disposed of in sanitary sewers, storm sewers, or landfills.

14. TRANSPORT INFORMATION

14.1 UN Number
DOT (US): UN1165  
IATA: UN1165  
IMDG: UN1165  
ADR/RID: UN1165

14.2 UN Proper Shipping Name
DOT (US)/IATA:
Dioxane
IMDG/ARD/RID:
DIOXANE

14.3 Transport Hazard Class(es)
DOT (US): 3  
IATA: 3  
IMDG: 3  
ADR/RID: 3

14.4 Packing Group
DOT (US): II  
IATA: II  
IMDG: II  
ADR/RID: II

14.5 Environmental Hazards
DOT (US): None  
IATA: None  
IMDG: None  
ADR/RID: None

14.6 Special Precautions for User
None

15. REGULATORY INFORMATION
This safety data sheet complies with the requirements of WHMIS (Canada), OSHA 1910.1200 (US), and EU Regulation EC No. 1907/2006 (European Union).

15.1 Safety, Health and Environmental Regulations/Legislation Specific for the Substance or Mixture
A) Canada
DSL/NDSL Status: This product or a component of this product is registered on the Canadian DSL/NDSL.

B) United States
TSCA Status: This product or a component is listed on the US EPA TSCA.

C) European Union
ECHA Status: This product or a component is registered with the EU ECHA.

15.2 Chemical Safety Assessment
No data available

16. OTHER INFORMATION

16.1 Revision History
Original Publication Date: 4/11/2018

16.2 List of Abbreviations
LD50  Median lethal dose of a substance required to kill 50% of a test population.
LC50  Medial lethal concentration of a substance required to kill 50% of a test population.
LDLo  Lowest known lethal dose
TDL0  Lowest known toxic dose
IARC  International Agency for Research on Cancer
16.3 Further Information
Copyright 2015. Toronto Research Chemicals Inc. Copies may be made for internal use only. The above information is believed to be correct to the best of our knowledge, but is to be only used as a guide. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. Please take all due care when handling this product.