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

1.1 Product Identifier
Chemical Name    Busulfan-d8

Catalogue #     B689902

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)                        WHMIS Symbols (Canada)
D1A     Very Toxic Material Causing Immediate and Serious Toxic Effects
        Highly Toxic by Inhalation/Skin Absorption   
D1B     Toxic Material Causing Immediate and Serious Toxic Effects
        Toxic by Ingestion
D2A     Very Toxic Material Causing Other Toxic Effects
        Carcinogen

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)
Acute Toxicity, Inhalation (Category 2)
Acute Toxicity, Dermal (Category 2)
Acute Toxicity, Oral (Category 3)
Carcinogenicity (Category 1B)

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

GHS Hazard Statements
H330          Fatal if inhaled.
H310          Fatal in contact with skin.
H301          Toxic if swallowed.
H350          May cause cancer.
**GHS Precautionary Statements**

P201  Obtain special instructions before use.

P260  Do not breathe dust/fume/gas/mist/vapours/spray

P280  Wear protective gloves/protective clothing/eye protection/face protection.

P284  IF ON SKIN: Gently wash with plenty of soap and water.

P302/P350  Immediately call a POISON CENTER or doctor/physician

**2.3 Unclassified Hazards/Hazards Not Otherwise Classified**

No data available.

**3. COMPOSITION/INFORMATION ON INGREDIENTS**

<table>
<thead>
<tr>
<th>3.1 Substances</th>
<th>Molecular Formula: C₆H₈D₈O₆S₂</th>
<th>Molecular Weight: 254.35</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS Registry #:</td>
<td>116653-28-2</td>
<td>EC#:</td>
</tr>
<tr>
<td>Synonyms</td>
<td>1,4-Butanediol-d₈-dimethanesulfonate Esters; Busulphan-d₈; CB-2041-d₈; GT-41-d₈; Busulfex-d₈; Misulban-d₈; Myleran-d₈;</td>
<td></td>
</tr>
</tbody>
</table>

**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, Sulfur 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: -20°C Freezer

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
Contains no components with established occupational exposure limits.

8.2 Exposure Controls

Appropriate Engineering Controls
A laboratory fumehood 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 goggles or face shield. 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 “chemical resistant” by EU standard EN 374 with the resistance codes corresponding to the anticipated use of the material. Unrated gloves are not recommended.
Suggested gloves: AnsellPro Sol-Vex nitrile gloves style 37-175, 15 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) coveralls or chemical-resistant bodysuit (laminated Tychem SL or equivalent).
Respiratory Protection
Recommended respirators are NIOSH-approved N100 or CEN-approved FFP3 particulate 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>White to Off-White Solid</td>
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</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>E) Melting Point/Freezing Point</th>
<th>F) Initial Boiling Point/Boiling Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>112-114°C</td>
<td>No data available</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>G) Flash point</th>
<th>H) Evaporation Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>No data available</td>
<td>No data available</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>M) Relative Density</th>
<th>N) Solubility</th>
</tr>
</thead>
<tbody>
<tr>
<td>No data available</td>
<td>Acetone, DMSO, Methanol</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Q) Decomposition Temperature</th>
<th>R) Viscosity</th>
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</thead>
<tbody>
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<td>No data available</td>
<td>No data available</td>
</tr>
</tbody>
</table>

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

9.2 Other Information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available.

10.2 Chemical Stability
Stable under recommended storage conditions.

10.3 Possibility of Hazardous Reactions
No data available.

10.4 Conditions to Avoid
No data available.

10.5 Incompatible Materials
Strong oxidizing agents.

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: Mouse - 110 mg/kg
   Dermal LD50: No data available.

B) Skin Corrosion/Irritation
   No data available

C) Serious Eye Damage/Irritation
   No data available

D) Respiratory or Skin Sensitization
   Inhalation LC50: No data available.
E) Germ Cell Mutagenicity
No data available

F) Carcinogenicity
Known human carcinogen.
This compound has been designated by the IARC as Group 1: Carcinogenic to humans.

G) Reproductive Toxicity/Teratogenicity
No data available

H) Single Target Organ Toxicity - Single Exposure
No data available

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 fatal if inhaled. May cause respiratory tract irritation.

- **Ingestion**
  Toxic if swallowed.

- **Skin**
  May be fatal if absorbed through skin. May cause skin irritation.

- **Eyes**
  May cause 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: EK1750000

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12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available.

12.2 Persistance and Degradability
No data available.

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.

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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.

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14. TRANSPORT INFORMATION

14.1 UN Number

Toronto Research Chemicals - B689902
This Safety Data Sheet contains 16 sections. All 16 sections must be present for this document to be valid.
14.2 UN Proper Shipping Name
DOT (US)/IATA: UN2811
IMDG/ADR/RID: UN2811

14.3 Transport Hazard Class(es)
DOT (US): 6.1
IATA: 6.1
IMDG: 6.1
ADR/RID: 6.1

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

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 is not listed on the US EPA TSCA.

C) European Union
ECHA Status: This product is not registered with the EU ECHA.

15.2 Chemical Safety Assessment
No data available

16. OTHER INFORMATION
16.1 Revision History
Original Publication Date: 1/8/2014

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
TDLo  Lowest known toxic dose
IARC  International Agency for Research on Cancer
NTP  National Toxicology Program
RTECS  Registry of Toxic Effects of Chemical Substances

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.