SECTION 1. IDENTIFICATION

Product Identifier: Dimethylsulfoxide (DMSO)
Other Means of Identification: DMSO, Methyl Sulfoxide, Sulfanylismethane
Product Code(s): DI4010
Product Family: Organic solution
Recommended Use: Laboratory and industrial use.
Restrictions on Use: None known.
Supplier Identifier: Alphachem Limited, 2485 Milltower Court, Mississauga, Ontario, L5N 5Z6, (905) 821-2995
Emergency Phone No.: CANUTEC CANADA, 613-996-6666, 24 Hours
SDS No.: 0418
Date of Preparation: March 07, 2016

SECTION 2. HAZARD IDENTIFICATION

Classified according to Canada’s Hazardous Products Regulations (WHMIS 2015) and the US Hazard Communication Standard (HCS 2012).

Classification:
Flammable liquid - Category 4

Label Elements:
Signal Word: Warning

Hazard Statement(s):
Combustible liquid.

Precautionary Statement(s):
Prevention:
Keep away from heat, sparks, open flames, and hot surfaces. – No smoking.
Wear protective gloves/protective clothing/eye protection/face protection.
In case of fire: Use carbon dioxide, dry chemical powder, appropriate foam to extinguish.

Storage:
Store in a well-ventilated place. Keep cool.

Disposal:
Dispose of contents and container in accordance with local, regional, national and international regulations.

Other Hazards:
None known.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>%</th>
<th>Other Identifiers</th>
</tr>
</thead>
</table>

Product Identifier: Dimethylsulfoxide (DMSO)
Date of Preparation: March 07, 2016
SECTION 4. FIRST-AID MEASURES

First-aid Measures

Inhalation
Remove source of exposure or move to fresh air. Get immediate medical advice or attention.

Skin Contact
Rinse with lukewarm, gently flowing water for 5 minutes. Get medical advice or attention if you feel unwell or are concerned.

Eye Contact
Rinse the contaminated eye(s) with lukewarm, gently flowing water for 5 minutes, while holding the eyelid(s) open.

Ingestion
Do not induce vomiting. Rinse mouth with water. If vomiting occurs, have person lie on side in the recovery position. Rinse mouth with water again. Immediately call a Poison Centre or doctor.

First-aid Comments
Some of the first-aid procedures recommended here require advanced first-aid training. If exposed or concerned, get medical advice or attention.

Most Important Symptoms and Effects, Acute and Delayed

None known.

Immediate Medical Attention and Special Treatment

Special Instructions
General advice
Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

SECTION 5. FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media
Carbon dioxide, dry chemical powder, appropriate foam, water spray or fog. Special "alcohol resistant fire-fighting foams".

Unsuitable Extinguishing Media
None known.

Specific Hazards Arising from the Product

Heating increases the release of toxic vapour. Closed containers may rupture violently when heated releasing contents.

In a fire, the following hazardous materials may be generated: very toxic carbon monoxide, carbon dioxide; very toxic, flammable formaldehyde.

Special Protective Equipment and Precautions for Fire-fighters

Fight fire from a safe distance or a protected location. Approach fire from upwind to avoid hazardous vapours or gases. Use water spray to flush spills away from ignition sources. For a massive fire, immediately evacuate the area and use unmanned hose holder or monitor nozzles. Dike and recover contaminated water for appropriate disposal.

Before entry, especially into confined areas, use an appropriate monitor to check for: toxic gases or vapours, flammable or explosive atmosphere, sufficient oxygen.

Fire-fighters may enter the area if positive pressure SCBA and full Bunker Gear is worn.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures

Use the personal protective equipment recommended in Section 8 of this safety data sheet. Increase ventilation to area or move leaking container to a well-ventilated and secure area. Eliminate all ignition sources. Use grounded, explosion-proof equipment. Remove or isolate incompatible materials as well as other hazardous materials.

Product Identifier: Dimethyl sulfoxide (DMSO)
Date of Preparation: March 07, 2016
Environmental Precautions
Do not allow into any sewer, on the ground or into any waterway.

Methods and Materials for Containment and Cleaning Up
Small spills or leaks: contain and soak up spill with absorbent that does not react with spilled product. Place used absorbent into suitable, covered, labelled containers for disposal.
Large spills or leaks: contact emergency services and manufacturer/supplier for advice.

SECTION 7. HANDLING AND STORAGE

Precautions for Safe Handling
Obtain special instructions before use. Avoid breathing in this product. Prevent all skin contact. Wear personal protective equipment to avoid direct contact with this chemical. Avoid generating vapours or mists. Only use where there is adequate ventilation. Prevent accidental contact with incompatible chemicals. Keep containers tightly closed when not in use or empty.

Conditions for Safe Storage
Store in an area that is: cool, well-ventilated, out of direct sunlight and away from heat and ignition sources, separate from incompatible materials (see Section 10: Stability and Reactivity). Store in the original, labelled, shipping container. Protect from conditions listed in Conditions to Avoid in Section 10 (Stability and Reactivity). Store in a closed container. Comply with all applicable health and safety regulations, fire and building codes.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH TLV®</th>
<th>OSHA PEL</th>
<th>AIHA WEEL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TWA</td>
<td>STEL</td>
<td>TWA</td>
</tr>
<tr>
<td>Dimethyl sulfoxide</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Appropriate Engineering Controls
Use local exhaust ventilation and enclosure, if necessary, to control amount in the air. Use non-sparking ventilation systems, approved explosion-proof equipment and intrinsically safe electrical systems in areas where this product is used and stored. Exhaust directly to the outside, taking any necessary precautions for environmental protection.

Individual Protection Measures

Eye/Face Protection
Not required but it is good practice to wear safety glasses or chemical safety goggles.

Skin Protection
Wear chemical protective clothing e.g. gloves, aprons, boots.
Suitable materials are: butyl rubber, Viton®/butyl rubber, Barrier® (PE/PA/PE), Silver Shield®/4H® (PE/EVAL/PE), Trellchem® HPS, Trellchem® VPS, Tychem® BR/LV, Tychem® TK.
The following materials should NOT be used: natural rubber, polyvinyl alcohol, polyvinyl chloride, Viton®.

Respiratory Protection
No specific guidelines are available. Contact chemical manufacturer, supplier or appropriate government agencies for advice.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Basic Physical and Chemical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Clear colourless liquid. Absorbs moisture from the air.</td>
</tr>
<tr>
<td>Odour</td>
<td>Not available</td>
</tr>
<tr>
<td>Odour Threshold</td>
<td>Not available</td>
</tr>
<tr>
<td>pH</td>
<td>Not available</td>
</tr>
<tr>
<td>Melting Point/Freezing Point</td>
<td>18.5 °C (65.3 °F) (melting); Not available (freezing)</td>
</tr>
<tr>
<td>Initial Boiling Point/Range</td>
<td>189 °C (372 °F)</td>
</tr>
</tbody>
</table>

Product Identifier: Dimethyl sulfoxide (DMSO)
Date of Preparation: March 07, 2016
Flash Point  87 °C (189 °F) (closed cup)
Evaporation Rate  > 300 (diethyl ether = 1)
Flammability (solid, gas)  Not available
Upper/Lower Flammability or Explosive Limit  26.5% (upper); 2.6% (lower)
Vapour Pressure  0.056 kPa (0.420 mm Hg) at 20 °C
Vapour Density (air = 1)  2.69 (calculated)
Relative Density (water = 1)  1.1 at 20 °C
Solubility  Soluble in all proportions in water; Soluble in all proportions in alcohols (e.g. ethanol).
Partition Coefficient, n-Octanol/Water (Log Kow)  -1.35
Auto-ignition Temperature  215 °C (419 °F)
Decomposition Temperature  270 - 355 °C (518 - 671 °F)
Viscosity  2.02 - 2.25 mm2/s at 20 °C (kinematic); 2.22 mPa.s at 20 °C (dynamic)

Other Information
Physical State  Liquid

SECTION 10. STABILITY AND REACTIVITY

Reactivity
Not reactive under normal conditions of use.
Chemical Stability
Normally stable.
Possibility of Hazardous Reactions
None known.
Conditions to Avoid
Open flames, sparks, static discharge, heat and other ignition sources. High temperatures. Temperatures above 87.0 °C (188.6 °F)
Incompatible Materials
Strong oxidizing agents (e.g. perchloric acid), strong acids (e.g. hydrochloric acid), strong bases (e.g. sodium hydroxide).
Hazardous Decomposition Products
Corrosive sulfur oxides; very toxic, flammable formaldehyde.

SECTION 11. TOXICOLOGICAL INFORMATION

Likely Routes of Exposure
Inhalation; skin contact; eye contact; ingestion.
Acute Toxicity

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>LC50</th>
<th>LD50 (oral)</th>
<th>LD50 (dermal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimethyl sulfoxide</td>
<td>&gt; 5330 mg/m3 (rat) (4-hour exposure)</td>
<td>14500 mg/kg (rat)</td>
<td>~ 40000 mg/kg (rat)</td>
</tr>
</tbody>
</table>

Skin Corrosion/Irritation
Animal tests show very mild irritation.
Serious Eye Damage/Irritation
Human experience and animal tests show no or very mild irritation.
STOT (Specific Target Organ Toxicity) - Single Exposure
Inhalation
No information was located.

Ingestion
If large amounts are swallowed may cause depression of the central nervous system. Symptoms may include headache, nausea, dizziness, drowsiness and confusion.

Aspiration Hazard
No information was located.

STOT (Specific Target Organ Toxicity) - Repeated Exposure
Causes effects on the central nervous system.
Causes dermatitis. Symptoms may include dry, red, cracked skin (dermatitis).

Respiratory and/or Skin Sensitization
No information was located for respiratory sensitization. Not a skin sensitizer.

Carcinogenicity

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>IARC</th>
<th>ACGIH®</th>
<th>NTP</th>
<th>OSHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimethyl sulfoxide</td>
<td>Not evaluated</td>
<td>Not Listed</td>
<td>Not Listed</td>
<td></td>
</tr>
</tbody>
</table>

Reproductive Toxicity

Development of Offspring
Not known to harm the unborn child.

Sexual Function and Fertility
Not known to cause effects on sexual function or fertility.

Effects on or via Lactation
No information was located.

Germ Cell Mutagenicity
Not known to be a mutagen.

Interactive Effects
No information was located.

SECTION 12. ECOLOGICAL INFORMATION
This section is not required by WHMIS. This section is not required by OSHA HCS 2012.

SECTION 13. DISPOSAL CONSIDERATIONS
Disposal Methods
Bury in a licensed landfill or burn in an approved incinerator according to federal, provincial/state, and local regulations.

SECTION 14. TRANSPORT INFORMATION

Special Precautions
Not applicable

Transport in Bulk According to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

SECTION 15. REGULATORY INFORMATION
Safety, Health and Environmental Regulations
Canada
Domestic Substances List (DSL) / Non-Domestic Substances List (NDSL)
Listed on the DSL.

USA

Product Identifier: Dimethyl sulfoxide (DMSO)
Date of Preparation: March 07, 2016
SECTION 16. OTHER INFORMATION

<table>
<thead>
<tr>
<th>NFPA Rating</th>
<th>Health - 2</th>
<th>Flammability - 2</th>
<th>Instability - 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDS Prepared By</td>
<td>Alphachem Limited</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone No.</td>
<td>(905)-821-2995</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date of Preparation</td>
<td>March 07, 2016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date of Last Revision</td>
<td>March 08, 2016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>References</td>
<td>CHEMINFO database. Canadian Centre for Occupational Health and Safety (CCOHS).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disclaimer</td>
<td>This document is offered only as a guide in the safe handling of the above product, and has been prepared from the best information currently available. It is not intended to be all-inclusive and the conditions of use may involve other additional considerations. Since Alphachem Limited cannot anticipate or control the conditions under which the product may be used, it will not be liable for any claims, damages or losses which may result from the use or reliance on any information herein.</td>
<td></td>
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</tr>
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