# APPENDIX E

# THERMINOL™ VP-1 HEAT TRANSFER FLUID MATERIAL SAFETY DATA SHEET

# Solutia Inc.

# Material Safety Data Sheet

## 1. PRODUCT AND COMPANY IDENTIFICATION

Product name: THERMINOL® VP1 Heat transfer fluid

Reference Number: 000000000211 Date: 12/03/2004

Company Information:

**United States:**
Solutia Inc.
575 Maryville Center Drive, P.O. Box 66760
St. Louis, MO 63166-6760
Emergency telephone: Chemtrec: 1-800-424-9300
Non-Emergency telephone: 1-314-674-6661

**Canada:**
Solutia Canada Inc.
6800 St. Patrick Street
LaSalle, PQ H8N 2H3
Emergency telephone: CANUTEC: 1-613-996-6666
Non-Emergency telephone: 1-314-674-6661

**Mexico:**
Solutia MEXICO, S. DE R.L. DE C.V.
Paseo de la Reforma No. 2654 Piso 3-A
Col. Lomas Altas
C.P. 11950 Mexico D.F.
Emergency telephone: SETIQ: (in Mexico) 01-800-002-1400
Non-Emergency telephone: (in Mexico) 01-55-5259-6800

**Brazil:**
Solutia Brazil Ltd.
Avenue Carlos Marcondes, 1200
CEP: 12241-420-São José dos Campos/SP-Brazil
Emergency telephone: 55 12 3932 7100 (PABX)
Non-Emergency telephone: 55 11 3365 1800 (PABX)

## 2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

| | |
|---|---|
| Form: | liquid |
| Colour: | clear to colourless |
| Odour: | characteristic |

WARNING STATEMENTS

WARNING!
Causes eye irritation
Causes skin irritation
Causes respiratory tract irritation
Contains material which can cause liver and nerve damage

POTENTIAL HEALTH EFFECTS

Likely routes of exposure: eye and skin contact
inhalation

| | |
|---|---|
| Eye contact: | Highly irritating to eyes. |
| Skin contact: | Highly irritating to skin.<br>Prolonged or repeated skin contact may result in irritant dermatitis. |
| Inhalation: | Severely irritating if inhaled.<br>No more than slightly toxic if inhaled.<br>Significant adverse health effects are not expected to develop under normal conditions of exposure. |
| Ingestion: | No more than slightly toxic if swallowed.<br>Significant adverse health effects are not expected to develop if only small amounts (less than a mouthful) are swallowed. |
| Signs and symptoms of overexposure: | headache<br>fatigue<br>nausea/vomiting<br>indigestion<br>abdominal pain<br>tremors |
| Target organs/systems: | May cause liver damage<br>May cause nerve damage |

Refer to Section 11 for toxicological information.

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

| Components | CAS No. | Average concentration | Concentration range | Units |
|---|---|---|---|---|
| diphenyl ether | 101-84-8 | 73.5 | | % |
| biphenyl | 92-52-4 | 26.5 | | % |

## 4. FIRST AID MEASURES

| | |
|---|---|
| If in eyes: | Immediately flush with plenty of water for at least 15 minutes.<br>If easy to do, remove any contact lenses.<br>Get medical attention.<br>Remove material from skin and clothing. |
| If on skin: | Immediately flush the area with plenty of water.<br>Remove contaminated clothing.<br>Wash skin gently with soap as soon as it is available.<br>Get medical attention.<br>Wash clothing before reuse. |
| If inhaled: | Remove patient to fresh air.<br>If not breathing, give artificial respiration.<br>If breathing is difficult give oxygen.<br>Remove material from eyes, skin and clothing. |
| If swallowed: | Immediate first aid is not likely to be required.<br>A physician or Poison Control Center can be contacted for advice. |

Wash heavily contaminated clothing before reuse.

## 5. FIRE FIGHTING MEASURES

| | |
|---|---|
| Fire point: | 127 C |
| Hazardous products of combustion: | carbon monoxide (CO); carbon dioxide; hydrocarbons |
| Extinguishing media: | Water spray, foam, dry chemical, or carbon dioxide |
| Unusual fire and explosion hazards: | None known |
| Fire fighting equipment: | Firefighters, and others exposed, wear self-contained breathing apparatus. Equipment should be thoroughly decontaminated after use. |
| Miscellaneous advice: | This product is not classified as a fire-resistant heat transfer fluid. Precautions to avoid sources of ignitions should be taken. |

## 6. ACCIDENTAL RELEASE MEASURES

| | |
|---|---|
| Personal precautions: | Use personal protection recommended in section 8. |
| Environmental precautions: | Keep out of drains and water courses. |
| Methods for cleaning up: | Contain large spills with dikes and transfer the material to appropriate containers for reclamation or disposal. Absorb remaining material or small spills with an inert material and then place in a chemical waste container. Flush spill area with water. |

Refer to Section 13 for disposal information and Sections 14 and 15 for reportable quantity information.

## 7. HANDLING AND STORAGE

Handling
Avoid contact with eyes, skin and clothing.
Avoid breathing vapour or mist.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.
Precautions against ignitions and fire should be taken with this product.
Heat transfer fluids are intended for INDIRECT heating purposes ONLY.
This product has not been approved for food grade use.

Emptied containers retain vapour and product residue. Observe all recommended safety precautions until container is cleaned, reconditioned or destroyed. Do not cut, drill, grind or weld on or near this container. The reuse of this material's container for non industrial purposes is prohibited and any reuse must be in consideration of the data provided in this material safety data sheet.

Storage
General: Stable under normal conditions of handling and storage.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Airborne exposure limits: (ml/m3 = ppm)

| | |
|---|---|
| THERMINOL® VP1 | No specific occupational exposure limit has been established. |
| biphenyl | ACGIH TLV: 0.2 ml/m3 ; mist ; 8-hr TWA<br>OSHA PEL: 0.2 ml/m3 ; 1.0 mg/m3 ; ; 8-hr TWA<br>Mexican OEL: 0.2 ml/m3 ; 1.5 mg/m3 ; ; 8-hr TWA<br>Mexican OEL: 0.6 ml/m3 ; 4 mg/m3 ; ; 15-min STEL |
| diphenyl ether | ACGIH TLV: 1 ml/m3 ; ; 8-hr TWA<br>ACGIH TLV: 2 ml/m3 ; ; 15-min STEL<br>OSHA PEL: 1 ml/m3 ; 7 mg/m3 ; ; 8-hr TWA<br>Mexican OEL: 1 ml/m3 ; 7 mg/m3 ; ; 8-hr TWA<br>Mexican OEL: 2 ml/m3 ; 14 mg/m3 ; ; 15-min STEL |
| Eye protection: | Wear safety goggles.<br>Have eye flushing equipment available. |
| Hand protection: | Wear chemical resistant gloves.<br>Consult the glove/clothing manufacturer to determine the appropriate type glove/clothing for a given application.<br>See Solutia Glove Facts for permeation data. |
| Body protection: | Wear suitable protective clothing.<br>Consult the glove/clothing manufacturer to determine the appropriate type glove/clothing for a given application.<br>Wear full protective clothing if exposed to splashes.<br>Wash contaminated skin promptly.<br>Launder contaminated clothing and clean protective equipment before reuse.<br>Wash thoroughly after handling.<br>Have safety shower available at locations where skin contact can occur. |
| Respiratory protection: | Avoid breathing vapour or mist.<br>Use approved respiratory protection equipment (full facepiece recommended) when airborne exposure limits are exceeded.<br>If used, full facepiece replaces the need for face shield and/or chemical goggles.<br>Consult the respirator manufacturer to determine the appropriate type of equipment for a given application.<br>Observe respirator use limitations specified by the manufacturer. |
| Ventilation: | Provide natural or mechanical ventilation to control exposure levels below airborne exposure limits.<br>If practical, use local mechanical exhaust ventilation at sources of air contamination such as processing equipment. |

Components referred to herein may be regulated by specific Canadian provincial legislation. Please refer to exposure limits legislated for the province in which the substance will be used.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | | |
|---|---|---|
| Flash point: | 110 C | Pensky-Martens closed tester |
| | 124 C | Cleveland Open Cup |
| Autoignition temperature: | 612 C | ASTM D-2155 |
| Density: | 1.06 g/cm3 @ 25 C | |

| | |
|---|---|
| Boiling point : | 257 C |
| Crystallising point : | 12 C |
| Water solubility: | ~25 mg/l |

NOTE: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

## 10. STABILITY AND REACTIVITY

| | |
|---|---|
| Conditions to avoid: | All sources of ignition. |
| Materials to avoid: | Contact with strong oxidizing agents. |
| Hazardous reactions: | Hazardous polymerization does not occur. |
| Hazardous decomposition products: | None known; |

## 11. TOXICOLOGICAL INFORMATION

This product has been tested for toxicity. Results from Solutia sponsored studies or from the available public literature are described below.

Acute animal toxicity data

| | |
|---|---|
| Oral: | LD50 , rat, 2,050 mg/kg , No more than slightly toxic |
| Dermal: | LD50 , rabbit, > 5,010 mg/kg , Practically nontoxic after skin application in animal studies. |
| Inhalation: | LC50 , rat, 2.66 mg/l , 4 h, Toxic based on animal inhalation exposure studies. |
| Skin irritation: | rabbit , Slightly irritating to skin., 24 h |
| Repeat dose toxicity: | rat, inhalation, 13 weeks,<br>Produced effects on body weight, serum enzymes and/or organ weights in repeat dose studies. |
| Repeat dose toxicity: | rat, gavage, 26 weeks,<br>Produced effects on body weight, serum enzymes and/or organ weights in repeat dose studies. Effects only observed at very high dose levels. |
| Target organs affected | kidneys, liver, spleen |
| Repeat dose toxicity: | rat, diet, subchronic,<br>Repeated oral exposure produced liver and kidney changes in animal models. |
| Target organs affected | liver, kidneys |
| Developmental toxicity: | rat, gavage, , No effects on offspring observed in laboratory animals in the presence of maternal toxicity. |
| Mutagenicity: | No genetic effects were observed in standard tests using bacterial and animal cells. |

Components

Data from Solutia studies and/or the available scientific literature on the components of this material which have been identified as hazardous chemicals under the criteria of the OSHA Hazard Communication Standard (29 CFR 1910.1200) or the Canadian Hazardous Products Act are discussed below.

| | |
|---|---|
| biphenyl | Chronic exposure has been reported to cause headache, fatigue, nausea, indigestion, abdominal pain, tremor, central and peripheral nerve damage and liver injury.<br>Slightly toxic following oral administration.<br>Practically nontoxic after skin application in animal studies.<br>Practically non irritating to skin (rabbit).<br>Slightly irritating to eyes (rabbit).<br>No mortality or signs of toxicity at the highest level achievable.<br>Irritating to respiratory system in animal models.<br>Produced effects on body weight, serum enzymes and/or organ weights in repeat dose studies.<br>Produced no dermal sensitization (guinea pigs).<br>No effects on offspring observed in laboratory animals in the presence of maternal toxicity.<br>No genetic effects were observed in standard tests using bacterial and animal cells. |
| diphenyl ether | Predictive patch testing on human volunteers did not produce irritation or sensitization.<br>Slightly toxic following oral administration.<br>Practically nontoxic after skin application in animal studies.<br>Slightly irritating to eyes (rabbit).<br>Slightly irritating to skin (rabbit).<br>Repeated exposure produced respiratory tract irritation in animal models.<br>Repeated exposure produced eye irritation in animal models.<br>No genetic effects were observed in standard tests using bacterial and animal cells. |

## 12. ECOLOGICAL INFORMATION

Environmental Toxicity:

| | | | |
|---|---|---|---|
| Invertebrates | 48 h, EC50 | Water flea (Daphnia magna) | 2.4 mg/l |
| Fish: | 96 h, LC50 | Rainbow trout (Oncorhynchus mykiss) | 7.6 mg/l |
| | 96 h, LC50 | Fathead minnow (Pimephales promelas) | 24 mg/l |
| Algae: | 96 h, EC50 | Algae (Selenastrum capricornutum) | 1.3 mg/l |
| Biodegradation | Modified SCAS (OECD 302A) Primary degradation 99 % | | |

## 13. DISPOSAL CONSIDERATIONS

US EPA RCRA Status: This material when discarded may be a hazardous waste as that term is defined by the Resource Conservation and Recovery Act (RCRA), 40 CFR 261.24, due to its toxicity characteristic. This material should be analyzed in accordance with Method 1311 for the compound(s) below.

| | | | |
|---|---|---|---|
| US EPA RCRA hazardous waste number: | D018 | Compound/Characteristic: | BENZENE |

Disposal considerations: Incineration

Miscellaneous advice: This product meets the criteria for a synthetic used oil under the U.S. EPA Standards for the Management of Used Oil (40 CFR 279). Those standards govern recycling and disposal in lieu of 40 CFR 260 -272 of the Federal hazardous waste program in states that have adopted these used oil regulations. Consult your attorney or appropriate regulatory official to be sure these standards have been adopted in your state. Recycle or burn in accordance with the applicable standards.
Solutia operates a used fluid return program for certain fluids under these used oil standards. Contact your Sales Representative for details.
This product should not be dumped, spilled, rinsed or washed into sewers or public waterways.

## 14. TRANSPORT INFORMATION

The data provided in this section is for information only. Please apply the appropriate regulations to properly classify your shipment for transportation.

US DOT

| | |
|---|---|
| Proper shipping name: | ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. *biphenyl* |
| Hazard Class: | 9 |
| Hazard Identification number: | UN3082 |
| Packing Group: | Packing Group III |
| Transport label: | Class 9 |
| Special provisions: | This material meets the definition of a marine pollutant. |
| Other: | Applies ONLY to containers with an RQ or for shipments in bulk or via intercoastal water transportation. |

Canadian TDG

| | |
|---|---|
| Other: | Not regulated for transport. |

Reportable Quantity/Limit

US DOT RQ 100 lb *biphenyl*
Package size containing reportable amount: 377 lb

ICAO/IATA Class

| | |
|---|---|
| Other: | See DOT Information |

## 15. REGULATORY INFORMATION

All components are in compliance with the following inventories: U.S. TSCA, EU EINECS, Canadian DSL, Australian AICS, Korean, Japanese ENCS, Phillipine PICCS, Chinese

Canadian WHMIS classification: D2(A) - Materials Causing Other Toxic Effects
D2(B) - Materials Causing Other Toxic Effects

SARA Hazard Notification:

| | |
|---|---|
| Hazard Categories Under Title III Rules (40 CFR 370): | Immediate<br>Delayed |
| Section 302 Extremely Hazardous | Not applicable |

Substances:

Section 313 Toxic Chemical(s): biphenyl

CERCLA Reportable Quantity:

100 lbs biphenyl
For this/these chemicals, release of more than the Reportable Quantity to the environment in a 24 hour period requires notification to the National Response Center (800-424-8802 or 202-426-2675).

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulation and the MSDS contains all the information required by the Canadian Controlled Products Regulation.

Refer to Section 11 for OSHA/HPA Hazardous Chemical(s) and Section 13 for RCRA classification.

Safety data sheet also created in accordance with Brazilian law NBR 14725

## 16. OTHER INFORMATION

Product use: Heat transferring agents

Reason for revision: New ANSI Standard

| | Health | Fire | Reactivity | Additional Information |
|---|---|---|---|---|
| Suggested NFPA Rating | 2 | 1 | 0 | |
| Suggested HMIS Rating: | 2 | 1 | 0 | G |

Prepared by the Solutia Hazard Communication Group. Please consult Solutia @ 314-674-6661 if further information is needed.

TM, ® is a registered trademark of Solutia Inc.
SOLUTIA is a trademark of Solutia Inc.
Responsible Care® is a registered trademark of the American Chemistry Council.

Although the information and recommendations set forth herein (hereinafter "Information") are presented in good faith and believed to be correct as of the date hereof, Solutia Inc. makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will Solutia Inc. be responsible for damages of any nature whatsoever resulting from the use of or reliance upon Information. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS.