1. Product and Company Identification

Material name: TOLUENE
Version #: 02
Revision date: 08-30-2011
Chemical name: TOLUENE
CAS #: 108-88-3
Product Codes:
J.T.Baker: 5375, 5584, 5812, 9336, 9351, 9364, 9456, 9457, 9459, 9460, 9462, 9466, 9472, 9476
Macron: 4483, 8604, 8608, V560
Synonym(s):
Methylbenzene; Toluol; Phenylmethane
Manufacturer information:
Avantor Performance Materials, Inc.
3477 Corporate Parkway
Suite #200
Center Valley, PA 18034 US
24 Hour Emergency 908-859-2151
Chemtrec 800-424-9300
Customer Service 855-282-6867

2. Hazards Identification

Emergency overview:
DANGER
Flammable liquid and vapor. Will be easily ignited by heat, spark or flames. Harmful if inhaled or absorbed through skin. Harmful or fatal if swallowed. Causes skin and eye irritation. Causes respiratory tract irritation. High vapor concentrations may cause drowsiness and irritation of the eyes or respiratory tract. May damage fertility or the unborn child. Prolonged exposure may cause chronic effects.

Potential health effects:
Routest of exposure:
Inhalation. Ingestion. Skin contact. Eye contact.
Eyes:
Causes eye irritation. High vapor/aerosol concentrations may be irritating.
Skin:
Harmful if absorbed through skin. Causes skin irritation. Prolonged or repeated contact with skin may cause redness, itching, irritation and eczema/chapping.
Inhalation:
Harmful if inhaled. May cause irritation to the mucous membranes and upper respiratory tract. In high concentrations, vapors and aerosol mists have a narcotic effect and may cause headache, fatigue, dizziness and nausea.
Ingestion:
Harmful or fatal if swallowed. Ingestion may result in vomiting; aspiration (breathing) of vomitus into lungs must be avoided as even small quantities may result in aspiration pneumonitis.
Target organs:
Chronic effects:
Can cause nervous system damage. May cause adverse reproductive effects - such as birth defects, miscarriages, or infertility based on animal data. Frequent or prolonged contact may defat and dry the skin, leading to discomfort and dermatitis.
Potential environmental effects:
Toxic to aquatic organisms.

3. Composition / Information on Ingredients

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS #</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOLUENE</td>
<td>108-88-3</td>
<td>99 - 100</td>
</tr>
</tbody>
</table>
4. First Aid Measures

First aid procedures

Eye contact
Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention.

Skin contact
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

Inhalation
Move to fresh air. If breathing is difficult, give oxygen. If breathing stops, provide artificial respiration. Get medical attention immediately.

Ingestion
Call a physician or poison control center immediately. Do not induce vomiting. If vomiting occurs, the head should be kept low so that stomach vomit doesn't enter the lungs.

Notes to physician
Treat symptomatically. Symptoms may be delayed.

General advice
Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

5. Fire Fighting Measures

Flammable properties
HIGHLY FLAMMABLE! Vapors may cause a flash fire or ignite explosively. Vapors may travel considerable distance to a source of ignition and flash back. Heat may cause the containers to explode.

Extinguishing media

Suitable extinguishing media

Unsuitable extinguishing media
Do not use water jet as an extinguisher, as this will spread the fire.

Protection of firefighters
Specific hazards arising from the chemical
Can be ignited easily and burns vigorously. Vapor from the solvent may accumulate in container headspace resulting in flammability hazard.

Protective equipment for firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

Fire fighting equipment/instructions
Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. Move containers from fire area if you can do so without risk. For massive fire in cargo area, use unmanned hose holder or monitor nozzles, if possible. If not, withdraw and let fire burn out. Some of these materials, if spilled, may evaporate leaving a flammable residue. Cool containers exposed to flames with water until well after the fire is out.

Specific methods
In the event of fire and/or explosion do not breathe fumes. Use water spray to cool unopened containers.

Hazardous combustion products
Carbon monoxide and carbon dioxide.

6. Accidental Release Measures

Personal precautions
Wear appropriate protective equipment and clothing during clean-up. Keep unnecessary personnel away. Keep upwind. Keep out of low areas. Ventilate closed spaces before entering them. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Local authorities should be advised if significant spillages cannot be contained.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground.

Methods for containment
ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop the flow of material, if this is without risk. Prevent entry into waterways, sewer, basements or confined areas. Dike the spilled material, where this is possible.
Methods for cleaning up

Use only non-sparking tools. All equipment used when handling the product must be grounded.

Large Spills: Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Dike far ahead of spill for later disposal.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Collect in a non-combustible container for prompt disposal.

Never return spills in original containers for re-use. Clean surface thoroughly to remove residual contamination. Clean up in accordance with all applicable regulations.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Handling

DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Take precautionary measures against static discharges. Wear appropriate personal protective equipment. Avoid breathing mist or vapor. Avoid contact with eyes, skin, and clothing. Do not taste or swallow. Use only with adequate ventilation. Wash thoroughly after handling. See Section 8 of the MSDS for Personal Protective Equipment.

Storage

Keep away from food, drink and animal feedingstuffs. Keep out of the reach of children. Keep container tightly closed in a cool, well-ventilated place. Ground container and transfer equipment to eliminate static electric sparks. Comply with all national, state, and local codes pertaining to the storage, handling, dispensing, and disposal of flammable liquids.

8. Exposure Controls / Personal Protection

Occupational exposure limits

<table>
<thead>
<tr>
<th>Material</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOLUENE (108-88-3)</td>
<td>TWA</td>
<td>20.0000 ppm</td>
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<th>Value</th>
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</thead>
<tbody>
<tr>
<td>TOLUENE (108-88-3)</td>
<td>TWA</td>
<td>50.0000 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>188.0000 mg/m3</td>
</tr>
</tbody>
</table>

Engineering controls

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Explosion proof exhaust ventilation should be used.

Personal protective equipment

Eye / face protection: Chemical goggles and face shield are recommended.

Skin protection: Wear appropriate chemical resistant clothing. Wear appropriate chemical resistant gloves.

Respiratory protection: Respirator type: Chemical respirator with organic vapor cartridge and full facepiece. Use a positive-pressure air-supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air-purifying respirators may not provide adequate protection.

General: Provide eyewash station and safety shower.

9. Physical & Chemical Properties

Appearance: Clear.
Color: Colorless.
Odor: Aromatic. Sweet.
Odor threshold: Not available.
Physical state: Liquid.
Form: Liquid.
pH: Not available.
Melting point: -139 °F (-94.9 °C)
Freezing point: -139 °F (-94.9 °C)
Boiling point: 231.8 °F (110.6 °C)
Flash point: 39.2 °F (4 °C) Closed Cup
Evaporation rate: 2.24 BuAc
Flammability limits in air, upper, % by volume: 7.1%
Flammability limits in air, lower, % by volume: 1.1%
Vapor pressure: 3.786 kPa at 25°C
Vapor density: 3.1
Specific gravity: 0.8636
Relative density: Not available.
Solubility (water): 0.7 g/l at 74°F
Partition coefficient: 2.73
Auto-ignition temperature: 896 °F (480 °C)
Percent volatile: 100%
Molecular weight: 92.14 g/mol
Molecular formula: C7-H8

10. Chemical Stability & Reactivity Information
Chemical stability: Stable under normal temperature conditions.
Conditions to avoid: Heat, flames and sparks.
Incompatible materials: Strong oxidizing agents. Chlorine.
Hazardous decomposition products: At thermal decomposition temperatures, carbon monoxide and carbon dioxide.
Possibility of hazardous reactions: Hazardous polymerization does not occur.

11. Toxicological Information

Toxicological data
Product: TOLUENE (108-88-3)
Acute Dermal LD50 Rabbit: 12124 mg/kg
Acute Inhalation LC50 Rat: 8000 ppm 4.00 Hours
Acute Oral LD50 Rat: 636 mg/kg

Acute effects: Harmful if inhaled or absorbed through skin. Harmful or fatal if swallowed.
Sensitization: Not a skin sensitizer.
Local effects: Irritating to eyes, respiratory system and skin. High vapor concentrations may cause drowsiness and irritation of the eyes or respiratory tract.
Chronic effects

Toluene: Concentrated, prolonged or deliberate inhalation may cause brain and nervous system damage. Prolonged and repeated exposure of pregnant animals (> 1500 ppm) have been reported to cause adverse fetal developmental effects. Frequent or prolonged contact may defat and dry the skin, leading to discomfort and dermatitis.

Carcinogenicity

This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

IARC Monographs. Overall Evaluation of Carcinogenicity

TOLUENE (CAS 108-88-3) 3 Not classifiable as to carcinogenicity to humans.

Neurological effects

High vapor/aerosol concentrations (attainable only at elevated temperatures) may cause central nervous system effects such as dizziness, drowsiness or headaches. Central and/or peripheral nervous system damage.

Mutagenicity

No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Reproductive effects

Possible risk of harm to the unborn child.

Teratogenicity

Components in this product have been shown to cause birth defects and reproductive disorders in laboratory animals.

Symptoms and target organs


Epidemiology

No epidemiological data is available for this product.

12. Ecological Information

Ecotoxicological data

<table>
<thead>
<tr>
<th>Product</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOLUENE (108-88-3)</td>
<td>EC50 Water flea (Daphnia magna): 5.46 mg/l 48.00 hours</td>
</tr>
<tr>
<td></td>
<td>LC50 Coho salmon, silver salmon (Oncorhynchus kisutch): 5.5 mg/l 96.00 hours</td>
</tr>
<tr>
<td></td>
<td>LC50 Fathead minnow (Pimephales promelas): 12.6 mg/l 96.00 hours</td>
</tr>
</tbody>
</table>

Ecotoxicity

Toxic to aquatic life.

Environmental effects

Toxic to aquatic organisms. Bioaccumulation is unlikely to be significant because of the low water solubility of this product. An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Persistence and degradability

Expected to be readily biodegradable.

Partition coefficient

2.73

13. Disposal Considerations

Disposal Instructions

Dispose of this material and its container to hazardous or special waste collection point. Incinerate the material under controlled conditions in an approved incinerator. All wastes must be handled in accordance with local, state and federal regulations.

Waste from residues / unused products

Dispose of in accordance with local regulations.

Contaminated packaging

Since emptied containers retain product residue, follow label warnings even after container is emptied. Residual vapors may explode on ignition; do not cut, drill, grind, or weld on or near this container. Offer rinsed packaging material to local recycling facilities.

14. Transport Information

TDG

<table>
<thead>
<tr>
<th>Proper shipping name</th>
<th>TOLUENE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard class</td>
<td>3</td>
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<tr>
<td>UN number</td>
<td>UN1294</td>
</tr>
<tr>
<td>Packing group</td>
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</tbody>
</table>
15. Regulatory Information

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

WHMIS status
Controlled

WHMIS classification
B2 - Flammable/Combustible
D2A - Other Toxic Effects-VERY TOXIC
D2B - Other Toxic Effects-TOXIC

WHMIS labeling

Inventory status

<table>
<thead>
<tr>
<th>Country(s) or region</th>
<th>Inventory name</th>
<th>On inventory (yes/no)*</th>
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</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Australian Inventory of Chemical Substances (AICS)</td>
<td>Yes</td>
</tr>
<tr>
<td>Canada</td>
<td>Domestic Substances List (DSL)</td>
<td>Yes</td>
</tr>
<tr>
<td>Canada</td>
<td>Non-Domestic Substances List (NDSL)</td>
<td>No</td>
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<tr>
<td>China</td>
<td>Inventory of Existing Chemical Substances in China (IECSC)</td>
<td>Yes</td>
</tr>
<tr>
<td>Europe</td>
<td>European Inventory of Existing Commercial Chemical Substances (EINECS)</td>
<td>Yes</td>
</tr>
<tr>
<td>Europe</td>
<td>European List of Notified Chemical Substances (ELINCS)</td>
<td>No</td>
</tr>
<tr>
<td>Japan</td>
<td>Inventory of Existing and New Chemical Substances (ENCS)</td>
<td>Yes</td>
</tr>
<tr>
<td>Korea</td>
<td>Existing Chemicals List (ECL)</td>
<td>Yes</td>
</tr>
<tr>
<td>New Zealand</td>
<td>New Zealand Inventory</td>
<td>Yes</td>
</tr>
<tr>
<td>Philippines</td>
<td>Philippine Inventory of Chemicals and Chemical Substances (PICCS)</td>
<td>Yes</td>
</tr>
<tr>
<td>United States &amp; Puerto Rico</td>
<td>Toxic Substances Control Act (TSCA) Inventory</td>
<td>Yes</td>
</tr>
</tbody>
</table>

* A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

Saf-T-Data

| Health: 2 - Moderate (Life) |
| Flammability: 3 - Severe (Flammable) |
| Reactivity: 1 - Slight |
| Contact: 2 - Moderate (Life) |
| Lab Protective Equip: DB - GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER |
| Storage Color Code: R - Red (Flammable) |

16. Other Information

NFPA ratings

| Health: 2 |
| Flammability: 3 |
| Instability: 0 |
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Material name: TOLUENE

Issue date 08-30-2011

This data sheet contains changes from the previous version in section(s):

Exposure Controls / Personal Protection: Respiratory protection