Section 1 - Product and Company Information

Product Name                       TERT-BUTANOL, 99.3+% (TEBOL 99)
Product Number                     B85927
Brand                              ALDRICH
Company                            Sigma-Aldrich
Street Address                     3050 Spruce Street
City, State, Zip, Country          SAINT LOUIS MO 63103 US
Technical Phone:                   314 771 5765
Emergency Phone:                   414 273 3850 Ext. 5996
Fax:                               800 325 5052

Section 2 - Composition/Information on Ingredient

<table>
<thead>
<tr>
<th>Substance Name</th>
<th>CAS #</th>
<th>SARA 313</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-METHYL-2-PROpanol</td>
<td>75-65-0</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Formula         C4H10O
Synonyms        Alcool butylique tertiaire (French) * Arconol * 
                t-Butanol * tert-Butanol * Butanol tertiaire 
                (French) * tert-Butyl alcohol (OSHA) * t-Butyl 
                hydroxide * 1,1-Dimethylethanol * Methanol, 
                trimethyl- * 2-Methyl-2-propanol * 
                2-Methylpropan-2-ol * NCI-C55367 * 2-Propanol, 
                2-methyl- * Trimethylcarbinol * Trimethyl methanol

RTECS Number:   EO1925000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW
Flammable (USA) Highly Flammable (EU). Harmful. 
Harmful by inhalation. Risk of serious damage to eyes. 
Target organ(s): Central nervous system. Kidneys.

HMIS RATING
HEALTH: 2*
FLAMMABILITY: 3
REACTIVITY: 0

NFPA RATING
HEALTH: 2
FLAMMABILITY: 3
REACTIVITY: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is
conscious. Call a physician.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLAMMABLE HAZARDS
Flammable Hazards: Yes

EXPLOSION HAZARDS
Vapor may travel considerable distance to source of ignition and flash back. Container explosion can occur under fire conditions. In advanced or massive fires the area should be evacuated and the fire should be fought from a remote explosion-resistant location.

FLASH POINT
51.8 °F   11 °C   Method: closed cup

EXPLOSION LIMITS
Lower: 2.4 %   Upper: 8 %

AUTOIGNITION TEMP
480 °C

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Carbon dioxide, dry chemical powder, or appropriate foam. Use water spray to cool fire-exposed containers. Unsuitable: Water may be effective for cooling, but may not effect extinguishment.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Specific Hazard(s): Flammable liquid. Vapor may travel considerable distance to source of ignition and flash back. Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area. Shut off all sources of ignition.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.
METHODS FOR CLEANING UP
Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe vapor. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep container closed. Keep away from heat, sparks, and open flame.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Use nonsparking tools. Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Government approved respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash thoroughly after handling. Wash contaminated clothing before reuse.

EXPOSURE LIMITS, RTECS

<table>
<thead>
<tr>
<th>Country</th>
<th>Source</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>ACGIH</td>
<td>TWA</td>
<td>100 PPM</td>
</tr>
<tr>
<td>USA</td>
<td>MSHA Standard-air</td>
<td>TWA</td>
<td>100 PPM (300 MG/M3)</td>
</tr>
<tr>
<td>USA</td>
<td>OSHA.</td>
<td>PEL</td>
<td>8H TWA 100 PPM (300 MG/M3)</td>
</tr>
<tr>
<td>New Zealand</td>
<td>OEL</td>
<td>Remarks: check ACGIH TLV</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>NIOSH</td>
<td>TWA</td>
<td>100 PPM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>STEL</td>
<td>150 PPM</td>
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</table>

EXPOSURE LIMITS

<table>
<thead>
<tr>
<th>Country</th>
<th>Source</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poland</td>
<td>NDS</td>
<td>300 MG/M3</td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>NDSCh</td>
<td>450 MG/M3</td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>NDSP</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Section 9 - Physical/Chemical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>At Temperature or Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Physical State: Liquid</td>
<td></td>
</tr>
<tr>
<td>Color: Colorless</td>
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<td></td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>74.12 AMU</td>
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<tr>
<td>pH</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>BP/BP Range</td>
<td>82 – 83 °C</td>
<td></td>
</tr>
<tr>
<td>MP/MP Range</td>
<td>25 – 26 °C</td>
<td></td>
</tr>
<tr>
<td>Freezing Point</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>31 mmHg</td>
<td></td>
</tr>
<tr>
<td>Vapor Density</td>
<td>2.5 g/l</td>
<td></td>
</tr>
<tr>
<td>Saturated Vapor Conc.</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>
SG/Density 0.79 g/cm³
Bulk Density N/A
Odor Threshold N/A
Volatile% N/A
VOC Content N/A
Water Content < 0.1 %
Solvent Content N/A
Evaporation Rate N/A
Viscosity N/A
Surface Tension N/A
Partition Coefficient N/A
Decomposition Temp. N/A
Flash Point 51.8 °F / 11 °C Method: closed cup
Explosion Limits Lower: 2.4 %
Upper: 8 %
Flammability N/A
Autoignition Temp 480 °C
Refractive Index 1.387
Flammable N/A
Optical Rotation N/A
Miscellaneous Data N/A
Solubility N/A

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Materials to Avoid: Strong oxidizing agents Copper, Copper alloys, Alkali metals, Aluminum.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide, Peroxides.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: May cause skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: Causes severe eye irritation.
Inhalation: Harmful if inhaled. Material may be irritating to mucous membranes and upper respiratory tract.
Ingestion: May be harmful if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)

SIGNS AND SYMPTOMS OF EXPOSURE
Can cause CNS depression. Exposure can cause: Gastrointestinal disturbances. Drying, cracking, or irritation of the skin.

TOXICITY DATA
Oral Rat
2743 mg/kg LD50
Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and

Inhalation
Rat
> 10,000 ppm
LC50

Intraperitoneal
Mouse
399 MG/KG
LD50
Remarks: Liver: Other changes.

Intravenous
Mouse
1538 MG/KG
LD50

Oral
Rabbit
3559 mg/kg
LD50

Skin
Rabbit
> 2000 mg/kg
LD50
Remarks: Skin and Appendages: Skin: After systemic exposure: Dermatitis, other

IRRITATION DATA

Skin
Rabbit
0.5 ml
24H
Remarks: Mild irritation effect

Eyes
Rabbit
0.1 ml
24H
Remarks: Severe irritation effect

CHRONIC EXPOSURE - CARCINOGEN
Result: This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

Species: Rat
Route of Application: Oral
Dose: 146 GM/KG
Exposure Time: 2Y
Frequency: C

Species: Mouse
Route of Application: Oral
Dose: 1540 GM/KG
Exposure Time: 2Y
Frequency: C
Result: Tumorigenic: Neoplastic by RTECS criteria. Endocrine: Thyroid tumors.

NTP CARCINOGEN LIST
Rating: Some evidence.
Species: Mouse/rat
Route: Drinking

ACGIH CARCINOGEN LIST
Rating: A4

CHRONIC EXPOSURE - TERATOGEN
Species: Rat
Dose: 2000 PPM/7H
Route of Application: Inhalation
Exposure Time: (1-19D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Species: Rat
Dose: 3500 PPM/7H
Route of Application: Inhalation
Exposure Time: (1-19D PREG)
Result: Specific Developmental Abnormalities: Musculoskeletal system.

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD
Result: Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

Species: Mouse
Dose: 103 GM/KG
Route of Application: Oral
Exposure Time: (6-20D PREG)
Result: Effects on Newborn: Stillbirth. Effects on Newborn: Growth statistics (e.g., reduced weight gain).

Species: Mouse
Dose: 135 GM/KG
Route of Application: Oral
Exposure Time: (6-20D PREG)
Result: Effects on Newborn: Live birth index (# fetuses per litter; measured after birth).

Species: Mouse
Dose: 20240 MG/KG
Route of Application: Oral
Exposure Time: (6-18D PREG)
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).
Section 12 - Ecological Information

ACUTE ECOTOXICITY TESTS

Test Type: LC50 Fish
Species: Pimephales promelas (Fathead minnow)
Time: 96 h
Value: 6,140 mg/l

Test Type: EC50 Daphnia
Species: Daphnia magna
Time: 48 h
Value: 933 mg/l

Test Type: IC50 Algae
Time: 72 h
Value: > 1,000 mg/l

ELIMINATION

Elimination: 99.9 %

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Butanols
UN#: 1120
Class: 3
Packing Group: Packing Group II
Hazard Label: Flammable liquid
PIH: Not PIH

IATA
Proper Shipping Name: Butanols
IATA UN Number: 1120
Hazard Class: 3
Packing Group: II

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: F Xn
R: 11 20
Risk Statements: Highly flammable. Harmful by inhalation.
S: 9 16
Safety Statements: Keep container in a well-ventilated place. Keep away from sources of ignition - no smoking.

US CLASSIFICATION AND LABEL TEXT
Risk Statements: Harmful by inhalation. Risk of serious damage
to eyes.
Safety Statements: Keep container in a well-ventilated place.
Keep away from sources of ignition - no smoking. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear eye/face protection.
US Statements: Target organ(s): Central nervous system. Kidneys.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: Yes
DEMINIMIS: 1 %
NOTES: This product is subject to SARA section 313 reporting requirements.
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION
WHMIS Classification: 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.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
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