Product Name: n-Propyl Bromide

Safety Data Sheet

1. PRODUCT IDENTIFICATION

Name                n-Propyl Bromide
Synonyms           1-bromopropane
CAS#               106-94-5
EC#                203-445-0
Product Uses      solvent for cleaning, adhesives, etc

EMERGENCY INFORMATION
Canada  Call CANUTEC (collect)  (613) 996-6666
U.S.A.   Call CHEMTREC           (800) 424-9300

2. HAZARDS

GHS Class
(Category) (2) flammable*
Signal Words DANGER WARNING
Hazard Statements highly flammable liquid & vapour
May cause respiratory tract irritation (H335)
May cause drowsiness or dizziness (H336)
Suspected of causing cancer by inhalation (H351)

GHS Precautionary Statements for Labelling
P210 Keep away from heat, sparks, open flames and hot surfaces. No smoking.
P240 Ground or bond container and receiving equipment.
P241 Use explosion-proof electrical, ventilating and lighting equipment.
P242, P243 Use only non-sparking tools. Take precautionary measures against static discharge.
P262, P264 Do not get in eyes. Wash thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P280 Wear eye protection, protective gloves and clothing of butyl or “Viton”.
P273 Avoid release to the environment.
P331 Collect spillage.
P313 & P333 If skin irritation or rash occurs, get medical advice/attention.
P304 & P340 Inhale removed person to fresh air and keep comfortable for breathing.

Canada – WHMIS
Key: B 2*, D 2A
B 2 – Flash Point <38°C, B 3 – Flash Point >38°C & <93°C
D 1 – Immediately Toxic, D 2 – Chronic Toxicity
C – Oxidising Substance, E – Corrosive, F – Reactive Substance

* see Part 5, “Flammability”

3. COMPOSITION

<table>
<thead>
<tr>
<th></th>
<th>%</th>
<th>TWAEV / TLV ppm / mg/m³</th>
<th>LD₅₀ (mg/kg) ORAL</th>
<th>LD₅₀ (mg/kg) SKIN</th>
<th>LC₅₀ ppm INHALATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Bromopropane</td>
<td>100%</td>
<td>0.1 / 0.5</td>
<td>540</td>
<td>&gt;2000</td>
<td>7100</td>
</tr>
</tbody>
</table>

Please ensure that this SDS is given to, and explained to people using this product.

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4. FIRST AID

SKIN: Wash with soap and plenty of water. Remove contaminated clothing and do not reuse until thoroughly cleaned or laundered.

EYES: Wash eyes with plenty of water, holding eyelids open. Remove contact lenses if present and easy to do so. Seek medical assistance promptly if there is irritation.

INHALATION: Remove from contaminated area promptly. **CAUTION: Rescuer must not endanger himself!** If breathing stops, administer artificial respiration and seek medical aid promptly.

INGESTION: Give plenty of water to dilute product. Do not induce vomiting (NOTE below). Keep victim quiet. If vomiting occurs, lower victim’s head below hips to prevent inhalation of vomited material. Seek medical help promptly.

Inadvertent inhalation of vomited material may seriously damage the lungs. The danger of this is greater than the risk of poisoning through absorption of this relatively low-toxicity substance. The stomach should only be emptied under medical supervision, and after the installation of an airway to protect the lungs.

5. FIRE FIGHTING & FLAMMABILITY

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash Point</td>
<td>-10°C to 70°C / 14°F to 158°F – wide range of values reported, including “will not flash”</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
<td>409 &amp; 490°C / 768 &amp; 914°F (see NOTE, below)</td>
</tr>
<tr>
<td>Flammable Limits</td>
<td>3.5% &amp; 4.6% – 9.7%</td>
</tr>
<tr>
<td>Combustion Products</td>
<td>carbon monoxide, nitrogen oxides, hydrogen bromide. part oxidised hydrocarbon fragments</td>
</tr>
<tr>
<td>Firefighting Precautions</td>
<td>CO₂, foam, dry chemical, water fog / spray; firefighters must wear SCBA</td>
</tr>
<tr>
<td>Static Discharge</td>
<td>not known – may accumulate a static charge</td>
</tr>
</tbody>
</table>


On the other hand, it has been reported that n-propyl bromide vapour, once ignited, extinguishes itself within minutes. Megaloid recommends this product should only be used in & around fully explosion-proof equipment.

Megaloid takes no responsibility if this product is used without all the precautions required for flammable materials.

6. ACCIDENTAL RELEASE MEASURES

**Serious Fire Potential:** blanket spill with foam as a precaution against accidental ignition. Take extreme care to avoid sparks – do not operate (turn on OR off) electrical appliances near spill, unless explosion proof.

Leak Precaution: dye to control spillage and prevent environmental contamination

Handling Spill: ventilate contaminated area; recover free liquid with explosion-proof pumps; absorb residue on an inert sorbent, sweep & pick up using plastic or aluminium shovel, & store in closed containers for recycling or disposal

7. HANDLING & STORAGE

Store and use in a cool dry environment, away from sources of ignition, heat and oxidising agents. **Take care to avoid sparks – use non-sparking bronze or aluminium hand tools. All electrical and mechanical equipment (lighting, switchgear, forklift trucks, etc) used with or around this product must be explosion-proof.** (see “NOTE”, Part 6)

This product may accumulate a static charge on agitation or on transfer between containers. Ground containers, mixers, and transfer equipment before handling to prevent static discharge, which may cause ignition. On transfer, ensure that the delivery nozzle is below the surface in the receiving container to prevent splash.

Empty containers may contain a flammable/explosive vapour. Never cut, drill, weld or grind on or near this container, whether empty or full. **Always replace drum, pail or IBC cap prior to moving the container!**

Avoid generating or breathing product vapour. Use with adequate ventilation to maintain airborne concentration of the product below the TLV (see Part 8). If dealing with a spill, and ventilation is impractical, wear a suitable respirator with organic vapour cartridge. Avoid contact with skin and wash work clothes frequently. An eye bath should be available near the workplace.

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8. EXPOSURE CONTROL & PERSONAL PROTECTION

Ontario TWAEV 10 ppm / 50 mg/m³
ACGIH TLV 0.1 ppm / 0.5 mg/m³
OSHA PEL not listed
Ventilation mechanical ventilation may be required to control airborne titre to regulated limits
Hands polyvinyl alcohol, “Barrier” gloves – confirm suitability with supplier
Eyes safety glasses with side shields – always protect the eyes
Clothing wear impermeable (above) apron, boots, & long sleeves if there is any danger of splashing.

9. PHYSICAL PROPERTIES

Odour & Appearance clear, colourless to pale yellow liquid with sweetish, characteristic odour
Odour Threshold not known
Vapour Pressure 1111 mmHg / 14.8 kPa (20°C / 68°F)
Evaporation Rate (Butyl Acetate = 1) not known – approx. 4
Vapour Density (air = 1) 4.25
Boiling Point 71°C / 160°F – decomposes above 204°C – 400°F
Freezing Point -110°C / -166°F
Specific Gravity 1.35 (20/20°C)
Water Solubility 2.5 grams per litre (20°C / 68°F)
- in other solvents most organic solvents
Viscosity 0.5 centipoise (20°C / 68°F)
pH none – does not yield hydrogen ions in solution
Conversion Factor 1 ppm = 5.02 mg/m³
Molecular Weight 123 grams per mole

10. REACTIVITY

Dangerously Reactive With strong oxidising agents; alkali metals; strong alkalies
Also Reactive With may react with finely powdered aluminum
Chemical Stability stable; will not polymerize
Decomposes in Presence of heat – temperatures above 204°C / 400°F
Decomposition Products thermal decomposition yields corrosive hydrogen bromide
Mechanical Impact not sensitive

11. TOXICITY

Effects, Acute Exposure
Skin Contact not irritating
Skin Absorption slight; toxic effects unlikely by this route
Eye Contact eye irritant
Inhalation may irritate; headache, dizziness, drowsiness, intoxication, numbness & weakness of extremities
Ingestion stomach pain, nausea, vomiting, diarrhoea – not a normal route of industrial exposure
LD₅₀ (oral) >2000⁴, 3600 & 4260 mg/kg (rat), 4700 mg/kg (mouse), 540 mg/kg (rabbit)⁵
LD₅₀ (skin) >2000 mg/kg (rat)⁵, 13,300 mg/kg (rabbit)⁵
LC₅₀ (inhalation) 7100 ppm (mouse), 17,800 ppm (rat), 30,000, 35,000 & 72,000 mg/m³ (rat)⁵

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11. TOXICITY, cont’d

Effects, Chronic Exposure
General prolonged or repeated exposure to liquid may cause dermatitis; vapour may be neurotoxic
Sensitising not known in humans or animals
Carcinogen/Tumorigen animal carcinogen (ACGIH – A3); reasonably anticipated to be a human carcinogen (NTP);
animal carcinogen on inhalation (2 years @ >62 & 72ppm) in 2 reports
Reproductive Effect no known effect on humans; reproductive toxin in rats @ 500-750ppm (6hr/day) – a high dose!
NOAEL (reproduction) 100ppm (inhalation, rat, maternal & offspring)
Mutagen not known to be a mutagen or teratogen in humans or animals
NOAEL (teratogen) 998ppm (inhalation, rat)
Synergistic With not known

12. ECOLOGICAL INFORMATION

Bioaccumulation n-propyl bromide has a low bioaccumulation potential
Biodegradation 70% biodegradation in 28 days (HSDB); 19% biodegradation in 28 days (EChA)
Abiotic Degradation est. ½-life in air is 17 days; ½-life in water (hydrolysis) 560hr @ pH=7
Mobility in soil, water slightly water soluble; moves slowly through soil and the water column; volatile product – much of a spill is likely to evaporate

Aquatic Toxicity
LC50 (Fish, 96hr) 24.3mg/litre (Oncorhynchus mykiss), 67mg/litre (Pimephales promelas)
EC50 (Crustacea, 48hr) 99.3mg/litre (Daphnia magna)
EC50 (Algae 72hr) 52, 55 & 72mg/litre (Pseudokirchneriella subcapitata)
EC50 (Bacteria) 8.7mg/litre (domestic sewage sludge)

13. DISPOSAL

Waste Disposal do not flush to sewer; recycle if possible, incinerate in approved facility with flue gas monitoring & scrubbing
Containers Drums should be reused. Recondition and pressure test by a licensed reconditioner prior to re-use.
Pails must be vented and thoroughly dried prior to crushing and recycling.
IBCs (intermediate bulk containers): polyethylene bottle must be pressure tested & recertified at 30 months.
Replace at 60 months (5yrs). Steel containers must be inspected, pressure tested & recertified every 5 years.
Never cut, drill, weld or grind on or near this container, even if empty

14. TRANSPORT CLASSIFICATION

Canada TDG PIN UN - 2344
AND Shipping Name bromopropanes
U.S.A. 49 CFR Class & Packing Group 3 (II)
Marine Pollutant not a marine pollutant
ERAP Required NO

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15. REGULATIONS

Canada DSL on inventory
U.S.A. TSCA on inventory
Europe EINECS on inventory

U.S.A. Regulations:
Threshold Limit Values: 8 hr Time Weighted Avg. (TWA): 36 ppm. Exposure Limit Recommendation: Exposures in working exposure levels may exceed 3 times the TLV-TWA for no more than a total of 30 minutes during a work day, and under no circumstances should they exceed 5 times the TLV-TWA, provided that the TLV-TWA is not exceeded.

Notice of Intended Changes: These substances, with their corresponding values and notations, comprise those for which (1) a limit is proposed for the first time, (2) a change in the Adopted value is proposed, (3) a change in the NCV is proposed, or (4) withdrawal of the Documentation and adopted TLV is proposed. In each case, the proposals should be considered final values during the period they are on the NCI. These proposals were notified by the AOCD Board of Directors and will remain on the NCI for approximately one year following this notification. If the Committee finds that receives any substantive data that changes its scientific opinion regarding an NCV, TLV, the Committee may then approve its recommendation to the AOCD Board of Directors for adoption. If the Committee fails to receive substantive data that changes its scientific opinion regarding an NCV, TLV, the Committee may change its recommendation to the AOCD Board of Directors for the matter to be either released or withdrawn from the NCI. Substance: 1-Chloropropene; Time Weighted Avg. (TWA): 0.1 ppm; Short Term Exposure Limit (STEL): None. Notations: A: Confirmed animal carcinogen with unknown relevance to humans; Molecular Weight: 122.99; TLV Basis: Central nervous system impairment, peripheral neuropathy, hematological effects, male and female reproductive toxicity, developmental toxicity.

16. OTHER INFORMATION

Prepared for Megaloid Laboratories by Peter Bursztyn, (705) 734-1577
Data from RTECS, HSDB (Haz. Substance Data Base), ChemInfo (CCOHS), IUCLID Datasheets (ESIS – European Chem. Substance Info. System), & others.
Preparation Date: December 2006 Revision Date: December 2009, March 2012, March 2015

(1) USA Centers for Disease Control and Prevention: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5748a2.htm

(2) European Chemicals Agency (ECHA) dossier on Propyl Bromide: