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Material Safety Data Sheet
TETRAHYDROFURAN

Section 1 - Product Identification

Synonyms : THF
Molecular Weight : 72.11 g/mol
Chemical Formula : C_4H_8O
Company Identification : Tradeasia International Pte. Limited
Address : 133 Cecil Street # 12-03 Keck Seng Tower, Singapore
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Recommended use of the chemical and restrictions on use:

- Solvent
- Polymerisation

Section 2 – Composition/Information on Ingredients

The product contains greater than 99.9 percent (%) borax decahydrate $Na_2B_4O_7.5H_2O$

Chemical Name	CAS No	Purity, %
Tetrahydrofuran	109-99-9	<= 100%

Section 3 – Hazards Identification

3.1 Classification of the substance according to GHS

Flammable Liquid 2
H225: Highly flammable liquid and vapour.
Carcinogenicity 2
H351: Suspected of causing cancer
Eye irritant 2A
H319: Causes serious eye irritation.
Acute Oral 5
H302: Harmful if swallowed.
Specific target organ toxicity – single exposure 3
H335: May cause respiratory irritation.

3.2. GHS Label elements, including precautionary statements

 Warning H351: Suspected of causing cancer	 Warning H319: Causes serious eye irritation. H302: Harmful if swallowed. H335: May cause respiratory irritation.	 H225: Flammable liquid and vapor.

Prevention:
P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P240: Ground/bond container and receiving equipment.

Response:
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313: IF exposed or concerned: Get medical advice/ attention.

Storage:
P403 + P233: Store in a well-ventilated place. Keep container tightly closed.

3.3. Other hazards which do not result in classification
None known.

Section 4 – First-Aid Measures

4.1. Description of first aid mesaures
Skin contact
Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician
Eye contact
rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.
Inhalation
If symptoms such as nose or throat irritation are observed, remove to fresh air. Call in physician.
Ingestion
immediately make victim drink water (two glasses at most). Consult a physician.
Note to physicians
N.A.
4.2. Most important symptoms and effects, both acute and delayed
N.A.
4.3. Indication of any immediate medical attention and special treatment needed
N.A.

Section 5 – Fire Fighting Measures

5.1. Suitable Extinguishing media
Dry powder, foam, CO2
5.2. Specific hazards arising from the chemical
Combustible.Pay attention to flashback.Vapours are heavier than air and may spread along floors.Forms explosive mixtures with air at ambient temperatures.Development of hazardous combustion gases or vapours possible in the event of fire.
5.3. Special protective actions for fire-fighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

Section 6 – Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures
Do not breathe vapours, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition. Evacuate the danger area, observe emergency procedures, consult an expert.
6.2. Environmental precautions
Do not let product enter drains. Risk of explosion.
6.3. Methods and material for containment and cleaning up
Land spill)

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions. Take up carefully with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

Spillage into water

Where possible, remove any intact containers from the water.

Section 7 – Handling and Storage

7.1. Precautions for safe Handling

Advice on safe handling: Observe label precautions.Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion: Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharge.

Hygiene measures: Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditionsKeep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition. Protected from light.Recommended storage temperature see product label.

Section 8 – Exposure Controls/Personal Protection

8.1. Control parameters

Derived No Effect Level (DNEL)

Worker DNEL, longterm	Local effects	inhalation	150 mg/m³
Worker DNEL, longterm	Systemic effects	inhalation	150 mg/m³
Worker DNEL, longterm	Systemic effects	dermal	25 mg/kg Body weight
Consumer DNEL, longterm	Systemic effects	inhalation	62 mg/m³
Consumer DNEL, longterm	Systemic effects	dermal	15 mg/kg Body weight
Consumer DNEL, acute	Local effects	inhalation	150 mg/m³
Consumer DNEL, acute	Systemic effects	inhalation	150 mg/m³

Predicted No Effect Concentration (PNEC)

PNEC Fresh water	4,32 mg/l
PNEC Fresh water sediment	23,3 mg/kg
PNEC Marine water	0,432 mg/l
PNEC Marine sediment	2,33 mg/kg
PNEC Sewage treatment plant	4,6 mg/l
PNEC Soil	2,13 mg/kg
PNEC Aquatic intermittent release	21,6 mg/l

8.2. Appropriate engineering controls
Technical measures and appropriate working operations should be given priority over the use of personal protective equipment.
8.3. Individual protection measures, such as personal protective equipment (PPE)
Individual protection measures
Protective clothing needs to be selected specifically for the workplace, depending on concentrations and quantities of the hazardous substances handled. The chemical resistance of the protective equipment should be enquired at the respective supplier.
Eye/face protection
Safety glasses
Hand protection
Splash contact:
Glove material: butyl-rubber
Glove thickness: 0,7 mm>
Break through time: 10 min
The protective gloves to be used must comply with the specifications of EC Directive 89/686/EEC and the related standard EN374, for example KCL 898 Butoject® (splash contact). The breakthrough times stated above were determined by KCL in laboratory tests acc. to EN374 with samples of the recommended glove types.
This recommendation applies only to the product stated in the safety data sheet<(>,<)> supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Other protective equipment
Flame retardant antistatic protective clothing.Respiratory protectionrequired when vapours/aerosols are generated.Recommended Filter type: Filter A (acc. to DIN 3181) for vapours of organic compoundsThe entrepeneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.
Environmental exposure controls
Do not let product enter drains. Risk of explosion.

Section 9 – Physical and Chemical Properties

9.1. Information on basic physical and chemical properties
Appearance : liquid
Odour : ether-like
Odour threshold : 2.0-59.0ppm
pH @ 20°C : 7-8
Melting point : -108.5°C
Boiling point : 65-66 °C
Flash point : -20°C
Evaporation rate : N.A.
Flammability : N.A.
Upper/lower flammability or explosive limits : Non explosive
Vapour pressure : 173 hPa
Vapour density : 2.5
Relative density : 0.89 g/cm^3
Solubility in water : soluble @ 20°C
Partition coefficient: n-octanol/water : log pow: 0.45 (25°C) OECD Test guideline 107 Bioaccumulation is not expected
Auto-ignition temperature : N.A.
Decomposition temperature : N.A.
Viscosity : 0.47 mPa.s @ 20°C

9.2. Other information
Molecular weight : 72.11

Section 10 – Stability and Reactivity

10.1. Reactivity
Vapours may form explosive mixture with air. Formation of peroxides possible.
10.2. Chemical stability
Sensitivity to light. Sensitive to air. Risk of explosion during distillation.
10.3. Possibility of hazardous reactions
A risk of explosion and/or of toxic gas formation exists with the following substances: alkali hydroxides, hydrides, Air, Strong oxidizing agents, Potassium, thionyl chloride aminophenol, with, peroxi compoundsGenerates dangerous gases or fumes in contact with:Bromine Exothermic reaction with:halides, Acids, peroxide compounds, metallic chlorides
10.4. Conditions to avoid:
Warning
10.5. Incompatible materials
Rubber, various plastics, Tin
10.6. Hazardous decomposition products
Peroxides

Section 11 – Toxicological Information

11.1. Information on toxicological effect
11.1.1. Substances
Acute toxicity[2]
Symptoms: mucosal irritations, Cough, Shortness of breath, Possible damages:, damage of respiratory tract
Skin corrosion / irritation
Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.
Serious eye damage/ irritation
Cause serious eye irritation
Respiratory or skin sensitization
No impairment of reproductive performance suspected.
Germcell mutagenicity
Not mutagenic.
Carcinogenicity
Suspected of causing cancer.
Reproductive toxicity
May cause respiratory irritation.
STOT-single exposure
N.A.
STOT-repeated exposure
N.A.
Aspiration Hazard
Borax pentahydrate has no aspiration hazard.

Section 12 – Ecological Information

12.1.Toxicity
Algal toxicity[9]
Cell multiplication inhibition test IC5 Scenedesmus quadricauda (Green algae): 3.700 mg/l; 8 d (maximum permissible toxic concentration)
Invertebrate toxicity[10]
static test EC50 Daphnia magna (Water flea): 3.485 mg/l; 48 h OECD Test Guideline 202

Fish toxicity[11]
flow-through test LC50 Pimephales promelas (fathead minnow): 2.160 mg/l; 96 h OECD Test Guideline 203
12.2. Persistence and degradability
Biodegradability39 %; 28 d; aerobic Biochemical oxygen demand OECD Test Guideline 301DNot readily biodegradable.
12.3. Bioaccumulative potential
Partition coefficient: n-octanol/water log Pow: 0,45 (25 °C)OECD Test Guideline 107 Bioaccumulation is not expected.
12.4. Mobility in soil
No Data Available
12.5. Other adverse effects
No Data Available

Section 13 – Disposal Considerations

13.1. Disposal methods
See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

Section 14 – Transport Information

Land Transport
14.1. UN number : UN2056
14.2. UN proper shipping name : TETRAHYDROFURAN
14.3. Transport of hazard classes : 3
14.4. Packing group : II
14.5. Environmental hazards : --
14.6. Special precautions for user : Yes
14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: D/E

Air Transport (IATA)
Land Transport
14.1. UN number : UN2056
14.2. UN proper shipping name : TETRAHYDROFURAN
14.3. Transport of hazard classes : 3
14.4. Packing group : II
14.5. Environmental hazards : --
14.6. Special precautions for user : No

Section 15 – Regulatory Information

15.1. Safety, health and environmental regulations
Major Accident: Hazard SEVESO III
Legislation: FLAMMABLE LIQUIDS P5cQuantity 1: 5.000 t Quantity 2: 50.000 t
Occupational restrictions: Take note of Dir 94/33/EC on the protection of young people at work. Observe work restrictions regarding maternity protection in accordance to Dir 92/85/EEC or stricter national regulations where applicable.

Regulation (EC) No 1005/2009 on substances that deplete the ozone layer: not regulated
Regulation (EC) No 850/2004 of the European Parliament and of the Council of 29 April 2004 on persistent organic pollutants and amending Directive 79/117/EEC: not regulated

Substances of very high concern (SVHC): This product does not contain substances of very high concern according to Regulation (EC) No 1907/2006 (REACH), Article 57 above the respective regulatory concentration limit of ≥ 0.1 % (w/w).

Section 16 : Additional Information

16.1. Mainly changes made to the previous version of this Material Safety Data Sheet (MSDS):
• This MSDS complies with ISO 11014; the requirements of UN-GHS

Revision No	Revision content
05	• This SDS is updated in accordance with the GHS (Rev.6) (2015)-Guidance on the Compilation of Safety data Sheets. • This SDS is updated in line with Eti Maden Corporate identity.

16.2. List of abbreviation and acronyms used in this MSDS
SDS : Safety Data Sheets
Index N° : atomic number of the element most characteristic of the properties of the substance
CAS No : Chemical Abstracts Service number
EC No : EINECS Number : European Inventory of Existing Commercial Substances
Repr. Cat. 2 : Substance presumed human reproductive toxicant
Acute Oral Cat. 5 : Substance which is of relatively low acute oral toxicity.
GHS : Globally Harmonised System of Classification and Labelling
LD_{50} : Median Lethal Dose
LC_{50} : Lethal Concentration, 50%
N.A. : Not Applicable
OSHA : Occupational Safety & Health Administration
Cal OSHA : The State of California Division of Occupational Safety and Health (DOSH)
PEL : Permissible Exposure Limits
ACGIH : American Conference of Governmental Industrial Hygienists
TLV : Threshold Limit Value
Japanese MITI : Japanese Ministry of International Trade and Industry
EC_{50} : Half maximal effective concentration
UN : United Nations
U.S. EPA TSCA Inventory: Inventory of the chemical substances manufactured or processed in the United States according to Toxic Substances Control Act compiled and published under the autority of the Environmental Protection Agency
Canadian DSL: Canadian Domestic Substances List
16.3. List of relevant hazard statements and precautionary statements used in this MSDS
Hazard Statement
H351: Suspected of causing cancer
H319: Causes serious eye irritation.
H302: Harmful if swallowed.
H335: May cause respiratory irritation.
H225: Flammable liquid and vapor.

Precautionary Statements
Prevention:
P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P240: Ground/bond container and receiving equipment.

Response:
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313: IF exposed or concerned: Get medical advice/ attention.

Storage:
P403 + P233: Store in a well-ventilated place. Keep container tightly closed.

16.4. References
1. Litovitz T L, Norman S A, Veltri J C, Annual Report of the American Association of Poison Control Centers Data Collection System. Am. J. Emerg. Med. (1986), 4, 427-458
2. Denton SM (1996). Acute oral toxicity study in the rat: anhydrous boric acid. Final report. Report no.: 1341/7-1032.
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6. Birge W J, Black J A, EPA-560/-76-008 (April 1977) PB 267 085
7. Scialli AR, Bonde JP, Brüske-Hohlfeld I, Culver D, Li Y, Sullivan FM; ELSEVIER 2009
8. Robbins WA, Xun L, Jia J, Kennedy N, Elashoff DA, Ping L. ;ELSEVIER 2009;(Reproductive Toxicology)
9. Hansveit and Oldersma, 2000; TNO Nutrition and Food Research Institute. Report No. V99.157.
10. Gersich, FM (1984a). Environ.Toxicol.Chem., 3 #1, 89-94 (1984)
11. Soucek et al., 2010. Illinois Natural History Survey, University of Illinois.
For general information on the toxicology of borates see ECETOC Technical Report No. 63 (1995); Patty's Industrial Hygiene and Toxicology, 4th Edition Vol. II, (1994) Chap. 42, 'Boron'.

16.5. Disclaimer of Liability
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