MATERIAL SAFETY DATA SHEET

STYRENE MONOMER - POLYESTER THINNERS

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I. Identification

SUPPLIER: Norski Holdings Ltd, 10 Northpoint Street, Plimmerton, 5024 New Zealand
PRODUCT NAME: Styrene Monomer - Polyester Thinners.
PRODUCE CODE: Polyester Thinners.
RECOMMENDED USE: Composites fabrication.

II. Hazard Classification

RISK PHRASES:
R 10 – Flammable.
R20 – Harmful by inhalation.
R36/38 – Irritating to eyes and skin.

SAFETY PHRASE(S):
S16 – Keep away from sources of ignition – no smoking.
S23 – Do not breathe gas/fumes/vapour/spray.
S26 – In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S36/37 – Wear suitable protective clothing and gloves.

III. Composition/Information on Ingredients

Ingredients

Name	CAS	EINECS	Proportion
Styrene	100-42-5	202-851-5	99-100%
Tertiary Butyl Catchol (TBC)	98-29-3	202-653-9	10-15ppm

IV. First Aid Measures

INHALATION: Remove the source of contamination or move the victim to fresh air. Ensure airways are clear and have qualified person give oxygen if breathing is difficult. Apply artificial respiration if not breathing. Seek medical attention.
INGESTION: Do not induce vomiting. Wash out mouth with water. Seek immediate medical attention.
SKIN: If skin or hair contact occurs, remove contaminated clothing and flush skin and hair with running water. Wash contaminated clothing before reuse or discard. Seek medical attention.
EYES: If contact with the eye(s) occurs, wash immediately with copious amounts of water holding the eyelid(s) open. Take care not to rinse contaminated water into the non-affected eye. Seek medical attention.
FIRST AID FACILITIES: Eye wash station, safety shower and normal washroom facilities.
ADVICE TO DOCTOR: Treat symptomatically.
EMERGENCY: 0800 POISON (764 766)

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V. Fire-fighting Measures

SUITABLE EXTINGUISHING MEDIA: Carbon dioxide, dry chemical or foam. Alcohol resistant foam is preferred. If not available normal foam can be used.
HAZARDS FROM COMBUSTION PRODUCTS: Under fire conditions this product may emit toxic and/or irritating fumes and gases including carbon monoxide and carbon dioxide.
SPECIFIC METHODS: Flammable liquid and vapour. Vapour/air mixtures may ignite explosively. Flashback along the vapour trail may occur. Runoff to sewer may cerate fire or explosion hazard.
HAZCHEM: 3Y.
DECOMPOSITION TEMP: Not available.
PRECAUTIONS IN CONNECTION WITH FIRE: Fight fire from safe location. Fire fighters should wear Self-Contained Breathing Apparatus (SCBA) operated in positive pressure mode and full protective clothing to prevent exposure to vapours or fumes. This product should be prevented from entering drains and watercourses. Water spray may be used to cool down heat-exposed containers.
UNSUITABLE EXTINGUISHING MEDIA: Do not use water jet.

VI. Accidental Release Measures

EMERGENCY PROCEDURES: Wear appropriate personal protective equipment and clothing to prevent exposure. Extinguish or remove all sources of ignition and stop leak if safe to do so. Increase ventilation. Evacuate all unprotected personnel. If possible, contain the spill. Place inert absorbent, non-combustible material onto spillage. Use clean non-sparking tools to collect the material and place into suitable labelled containers for subsequent recycling or disposal. Dispose of waste according to the applicable local and national regulations. If contamination of sewers or waterways occurs inform the local water and waste management authorities in accordance with local regulations.

VII. Handling and Storage

PRECAUTIONS FOR SAFE HANDLING: Flammable liquid. Exposure without protection must be prevented. Avoid exposure, contact with skin and eyes. Do not store or use in confined spaces. Avoid breathing in spray or mists or vapours. Wear overalls, impervious gloves and safety glasses. Use in designated areas and adequate ventilation. Use approved flammable liquid storage containers in the work area. Prevent release of vapours and mists into workplace air. Keep containers tightly closed. Take precautionary measures against static discharges. Keep material away from sparks, flames and other ignition sources. Do not empty into drains. Ensure a high level of personal hygiene is maintained when using this product, that is, always wash hands before eating, drinking, smoking or using the toilet facilities.
CONDITIONS FOR SAFE STORAGE: Store in the shade, in a well-ventilated area preferably below 30^0C and well away from sources of ignition. This product should be stored away from foodstuffs, strong oxidising agents and other incompatible materials. Handle and store in accordance with applicable local and national regulations for flammable liquids. The product has a limited storage life due to inhibitor depletion and should be used within six months of delivery. Rapid polymerisation resulting in violent rupture of closed containers and possible fire from flammable vapours may be initiated by high temperatures or certain contaminants. Oxidising agents (eg organic peroxides), strong acids (eg sulphur acid), ferrous salts present in rust, and some metal halides promote polymerisation. Alkalis reduce the inhibitor concentration and increase the risk of spontaneous polymerisation. Contamination of the product with these substances should be avoided. Exposure to UV radiation (including from light fittings), can initiate slow polymerisation that may continue in a sealed container. For information on the design of the storeroom, reference should be made to Australian Standard AS1940 – The storage and handling of flammable and combustible liquids. Reference should also be made to all State and Federal regulations.

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VIII. Exposure Controls/Personal Protection

NATIONAL EXPOSURE STANDARDS:

	Regulations	Exposure Duration	Exposure Limit	Units	Notes
Substance	NOHSC:1003	TWA	50	ppm	
	NOHSC:1003	TWA	213	mg/m3	
	NOHSC:1003	STEL	100	ppm	
	NOHSC:1003	STEL	426	mg/m3	

BIOLOGICAL LIMIT VALUES:
Name: Styrene
Determinant: Mandelic acid plus phenylglyoxylic acid.
Specimen: Creatinine in urine.
Value: 400 mg/g.
Sampling time: End of shift.
Source: American Conference of Industrial Hygienists (ACGIH).
OTHER EXPOSURE INFORMATION: No exposure standards have been established for this material by the National Occupational Health and Safety Commission (NOHSC. However, exposure standards on the ingredients are stated above.
As published by the National Occupational Health and Safety Commission (NOHSC):
TWA – the Time-Weighted Average airborne concentration over an eight-hour working day, for a five-day working week over an entire working life.
STEL (Short Term Exposure Limit) – the average airborne concentration over a 15 minute period which should not be exceeded at any time during a normal eight-hour workday. According to current knowledge these concentrations should neither impair the health of, nor cause undue discomfort to, nearly all workers.
ENGINEERING CONTROLS: Provide sufficient ventilation to keep airborne levels below the exposure limits or as low as possible. Where vapours or mists are generated, particularly in enclosed areas, and natural ventilation is inadequate, a flameproof exhaust ventilation system is required. Refer to relevant regulations for further information concerning ventilation requirements. Refer to AS1940 – The storage and handling of flammable and combustible liquids and AS/NZS2430.3.1:1997 : Classification of hazardous areas – Examples of area classification – General, for further information concerning ventilation requirements.
RESPIRATORY PROTECTION: If engineering controls are not effective in controlling airborne exposure then an approved respirator with a replaceable vapour/mist filter should be used. Refer to relevant regulations for further information concerning respiratory protective requirements. Reference should be made to Australian Standards AS/NZS1715, Selection, Use and Maintenance of Respiratory Protective Devices; and AS/NZS1716, Respiratory Protective Devices.
EYE PROTECTION: Safety glasses with side shields, chemical goggles or full face shield as appropriate should be worn. Final choice of appropriate eye/face protection will vary according to individual circumstances. Eye protection devices should conform to relevant regulations. Eye protection should conform to Australian/New Zealand Standard AS/NZS1337 – Eye Protectors for Industrial Applications.
HAND PROTECTION: Wear impervious gloves. Final choice of appropriate gloves will vary according to individual circumstances ie methods of handling or according to risk assessments undertaken. Occupational protective gloves should conform to relevant regulations. Reference should be made to AS/NZS2161.1: Occupational protective gloves – Selection, use and maintenance.
BODY PROTECTION: Suitable protective clothing should be worn eg cotton overalls buttoned at neck and wrist. Chemical resistant apron is recommended where large quantities are handled.

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IX. Physical and Chemical Properties

APPEARANCE: Clear, colourless oily liquid.
ODOUR: Strong aromatic hydrocarbon odour.
DECOMPOSITION TEMPERATURE: Not available.
MELTING POINT: Not available.
BOILING POINT: 145^{0}C.
SOLUBILITY IN WATER: Insoluble (0.300 g/l [20^{0}C])
SOLUBILITY IN ORGANIC SOLVENTS: Miscible with benzene and ethanol.
SPECIFIC GRAVITY: 0.902 (25^{0}C).
pH VALUE: Not available.
VAPOUR PRESSURE: 0.6 kPa at 20^{0}C.
VAPOUR DENSITY: 3.6 (Air = 1).
EVAPORATION RATE: 0.49 (n-Butyl acetate = 1)
ODOUR THRESHOLD: 0.1 ppm (approximate)
VISCOSITY: 0.763 cpa (20^{0}C).
OCTANOL/WATER PARTITION COEFFICIENT: Not available.
FLASH POINT: 31^{0}C (Tag Closed Cup).
FLAMMABILITY: Flammable.
AUTO-IGNITION TEMPERATURE: 490^{0}C.
FLAMMABLE LIMITS – LOWER: 1.1% v/v.
FLAMMABLE LIMITS – UPPER: 6.1% v/v.
MOLECULAR WEIGHT: 104.14.
DYNAMIC VISCOSITY: Not available.
SATURATED VAPOUR CONCENTRATION: 8000 ppm (25^{0}C).
OTHER INFORMATION: 1ppm – 4.25 mg/m^3; 1 mg/m^3 = 0.24 ppm (25^{0}C).

X. Stability and Reactivity

STABILITY AND REACTIVITY: Refer to Section 10.
CHEMICAL STABILITY: Stable under normal conditions of storage and handling.
CONDITIONS TO AVOID: Heat, open flames and other sources of ignition.
INCOMPATIBLE MATERIALS: Alkylation catalysts and strong acids (H2S04, H3P04, BF3, A1C13), halogens and hydrogen halides. Contact with copper and copper alloys. Strong oxidising agents. Untreated clays and micas may cause an exothermic reaction with styrene and ignite the monomer. Strong alkali (eg caustic soda) and glycols remove inhibitor.
HAZARDOUS DECOMPOSITION PRODUCTS: Under fire conditions this product may emit toxic and/or irritating fumes, smoke and gases including carbon monoxide, carbon dioxide and oxides of nitrogen.
HAZARDOUS REACTIONS: Reacts with incompatible materials. .
HAZARDOUS POLYMERISATION: May occur in the presence of polymerisation accelerators. If temperature rise or other signs of polymerisation are observed, cool monomer quickly and add inhibitor with thorough mixing.

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XI. Toxicological Information

TOXICOLOGY INFORMATION: Styrene.
LD50 (oral, rat) = 2,650mg/kg.
LD50 (dermal, rabbit) > 5,010mg/kg.
Eye irritation (rabbit) (standard draize); moderate to severe
Skin irrigation (rabbit) (standard draize); mild to moderate.
INHALATION: Harmful by inhalation. Vapour can cause severe irritation to the respiratory tract. Styrene at 400ppm is irritating to all parts of the respiratory tract. Styrene possesses narcotic-like properties; excessive exposure may result in headache, dizziness, incoordination, fatigue, nausea, loss of appetite and loss of consciousness.
INGESTION: Ingestion of this product may irritate the gastric tract causing nausea and vomiting.
SKIN: Irritating to skin resulting in redness and itching.
EYE: Irritating to eyes. On eye contact this product will cause tearing, stinging, blurred vision, redness and possible conjunctivitis.
CHRONIC EFFECTS: Continued exposures to levels near 400 ppm can cause respiratory tract irritation; prolonged inhalation of vapours can cause respiratory tract obstruction. Peripheral neuropathy is possible upon long-term exposure to styrene. CNS depression is possible upon long-term exposure to styrene.
CARCINOGENICITY: It is important to note that Styrene is classified as 'possibly carcinogenic to humans (Group 2B)' by the International Agency for Research on Cancer (IARC).

XII. Ecological Information

ECOTOXICITY:
Styrene is moderately toxic to fish and daphnia and highly toxic to algae.
LC50 (Fathead minnow, 96hr) – 10ml/L moderately toxic.
EC50 (Daphnia magna, 48hr) – 4.7 mg/L moderately toxic.
EC50 (Green algae, 96hr) – 0.72 mg/L highly toxic.
PERSISTENCE/DEGRADABILITY: Styrene has been shown to undergo slow, but nearly complete biodegradation in laboratory studies. Styrene released to soil will have low mobility and will biodegrade. Styrene released to water will float and volatilise (Henrys consent – 0.00275 atm m^3/mole at 25^0C) and will biodegrade. Styrene vapour will degrade rapidly in the ambient atmosphere. Styrene is not expected to persist in the environment.
MOBILITY: Styrene is expected to bind to soils and sediments, and have low mobility. The estimated organic carbon/water partition coefficient (log Koc) = 2.42 – 2.96.
BIOACCUMULATIVE POTENTIAL: Although the octanol/water partition coefficient (log Kow) for styrene has been determined to be 2.95, indicating a moderate potential to bioaccumulate, the bioconcentration factor (log BCF) in goldfish has been determined to be 0.83 – 1.13, indicating a reduced bioconcentration potential in aquatic organisms.
ENVIRONMENT PROTECTION: Do not allow product to enter drains, waterways or sewers.

XIII. Disposal Considerations

DISPOSAL CONSIDERATIONS: Dispose of waste according to applicable local and national regulations. Labels should not be removed from containers until they have been cleaned. Do not cut, puncture or weld on or near containers. Empty containers may contain flammable residues. Contaminated containers must not be treated as household waste. Containers should be cleaned by appropriate methods and then re-used or disposed of by landfill or incineration as appropriate. Do not incinerate closed containers. Advise flammable nature.

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XIV. Transport Information

- Class 1, Explosives.
- Class 2.1, Flammable gases
- Class 2.3, Toxic gases
- Class 4.2, Spontaneously combustible substances
- Class 5.1, Oxidising substances
- Class 6, Toxic substances (where the flammable liquid is nitromethane)
- Class 7, Radioactive materials unless specifically exempted

UN NUMBER: 2055
PROPER SHIPPING NAME: Styrene Monomer, Stabilised
DG CLASS: 3
HAZCHEM CODE: 3Y
PACKING GROUP: III
IERG NUMBER: 19G
IMO PROPER SHIPPING NAME: Styrene Monomer, Stabilised
IMDG UN NUMBER: 2055
IMDG HAZARD CLASS: 3
IMDG PACK GROUP: III

XV. Regulatory Information

REGULATORY INFORMATION: Classified as hazardous according to criteria of National Occupational Health & Safety Commission (NOHSC). Classified as a Scheduled Poison S5 according to the Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).
POISONS SCHEDULE: S5
HAZARD CATEGORY: Harmful, Irritant, Flammable.