Safety Data Sheet

1. Identification of the Substance/Mixture and the Supplier

Supplier	:	National Institute of Advanced Industrial Science and Technology (AIST)
Address	:	1-3-1 Kasumigaseki, Chiyoda, Tokyo, Japan
Office in Charge	:	Reference Materials Office, Center for Quality Management of Metrology, National Metrology Institute of Japan
Person in Charge	:	Certified Reference Material Staff
Telephone No.	:	+81-29-861-4059 Fax No. : +81-29-861-4009
Emergency Contact	:	Same as above
		Prepared on : February 8, 2012
		Revised on : August 31, 2022
		ID Number : 4003002
Identity of Substance/Mixture	:	Certified reference material: NMIJ CRM 4003-b Toluene
Recommended Use of the Chemical and Restriction on Use	:	This reference material can be used, in calibration of toluene concentration in standard solution. Do not use this reference material for other purposes than testing/research. This CRM is a reference material (specified in the Japanese Industrial Standard (JIS) Q 0030).

2. Hazards Identification

GHS Classification:	Flammable liquid	:	Hazard Category 2
	Acute toxicity (Oral)	:	Hazard Category 5
	Acute toxicity (Inhalation)	:	Hazard Category 4
	Skin corrosion/irritation	:	Hazard Category 2
	Serious eye damage/ eye irritation	:	Hazard Category 2B
	Reproductive toxicity	:	Hazard Category 1A
	Specific target organ toxicity/Systemic toxicity (Single exposure)	:	Hazard Category 1 (Central nervous system) Hazard Category 3 (Narcotic effects)) Hazard Category 3 (Respiratory tract irritation)
	Specific target organ toxicity/Systemic toxicity (Repeated exposure))	:	Hazard Category 1 (Central nervous system) Hazard Category 1 (Liver) Hazard Category 1 (Kidney)
	Aspiration respiratory hazard	:	Hazard Category 1
	Aquatic toxicity (Acute)	:	Hazard Category 2

GHS Label Element:

Signal Word:	Danger
Hazards Statement:	Highly flammable liquid and vapor Skin irritation Eye irritation May be harmful if swallowed Harmful by inhalation May have adverse effects on sexual function and fertility or embryo/ fetus Organ dysfunction (Central nervous system) May lead to irritation of respiratory system May lead to drowsiness or dizziness May cause damage to organ by prolonged or repeated exposure (Central nervous system, kidney and liver) May be fetal if swallowed or if aspirated into respiratory tract Aquatic toxicity
Other Hazards:	May cause serious poisoning through vapor inhalation
Precautionary Statement:	［Precaution］ Use eye protector/face protector/gloves. Prevent release of this reference material to the environment. Obtain the certificate of this reference material prior to use, and do not handle it before reading and understanding all safety precautions. Use this reference material only in an outdoor or well-ventilated environment. Wash hands thoroughly after handling this reference material. Keep this reference material away from heat/spark/open flame/ high-temperature items. No smoking. Avoid mist/vapor inhalation. In case of fire, use appropriate fire-extinguishing means. Take off contaminated clothing and wash it when it is reused. ［Action］ Eye contact: Irrigate eyes carefully with water for a few minutes. Then take out contact lenses if it is possible to easily do so. Keep irrigating eyes after taking out contact lenses. Seek medical examination/treatment if eye irritation is prolonged. Seek medical attention when feeling sick. Ingestion: Seek medical attention when feeling sick. Flush mouth. Do not make the person vomit. Inhalation: Move the person to fresh air and keep him/her at rest in an easy-to-breathe position. Skin contact: Take off all contaminated clothing immediately. Flush exposed skin area with running water. Seek medical examination/ treatment if skin irritation develops. When being exposed or when there are concerns about exposure: Seek medical examination/treatment. ［Storage］ Store in a locked area. Store this reference material in a light-shielded clean environment at about 5 °C. ［Disposal］ Incinerate this reference material and its containers in an appropriate incinerator. Or entrust disposal of this reference material and its containers to a professional waste disposal company licensed by prefectural government. Hazards not mentioned above are either not classifiable or not applicable.

3. Composition/Information on Ingredients

Substance or mixture	:	Substance :
Chemical Identity	:	Toluene
Content	:	Certified value of purity of Toluene is about 99.9%
Chemical Formula or Structural Formula	:	$C_6H_5CH_3$
Melecular Weight	:	92.14
Content	:	99.9 %
Reference Number in Gazetted List in Japan	:	Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. : (3)-2 Industrial Safety and Health Act : Published
CAS Number	:	108-88-3
Hazardous Ingredient	:	Toluene (Deliterious substance) about15 mL

4. First-aid Measures

Eye Contact	:	Irrigate eyes thoroughly with clean water. Seek medical examination/treatment.
Skin Contact	:	Flush exposed skin area thoroughly with clean water. Take off contaminated clothing and shoes. Seek medical examination/ treatment.
Inhalation	:	Move the person to fresh air and keep him/her at rest and warm. Seek medical examination/treatment.
Ingestion	:	Flush mouth thoroughly with water. Seek medical attention.
Expected Acute Symptoms and Delayed Symptoms	:	Dizziness, headache, nausea, hangover May be fatal in a worst case
The Most Critical Characteristics and Symptoms	:	-
Protection of First-Aid Provider	:	Use personal protective equipment such as rubber gloves and hermetically-sealed goggles.

5. Fire-fighting Measures

Extinguishing Media	:	Dry-powder-type extinguisher, foam extinguisher, CO_2, dry sand, water spray (Do not use water jet)
Fire-Specific Hazards	:	Use appropriate personal protective equipment so as to avoid smoke inhalation during fire-fighting.
Specific Fire-Fighting Method	:	Eliminate combustion sources at the origin of a fire and put out fire by using extinguishing media. Move movable containers immediately to a safe place. In the case of immovable containers, cool their surroundings with sprayed water.
Protection of Fire-Fighters	:	Carry out fire-fighting from the windward in order to avoid inhalation of hazardous gas. Use personal protective equipment such as oxygen mask.

6. Accidental Release Measures

Personal Precaution	:	Immediately remove potential ignition sources from surrounding

		areas. Make fire-extinguishing tools available to prepare for fire ignition.
Personal Protective Equipment and Emergency Procedures	:	Ventilate the affected area thoroughly until the clean-up operation is completed when accidental release takes place indoor. Use appropriate personal protective equipment during the operation to avoid skin contact of splash etc. and inhalation of dust and gas.
Environmental Precautions	:	Take precautions to prevent the spilled toluene from draining into rivers etc. to adversely impact the environment. Make it sure to appropriately treat contaminated wastewater in order to prevent untreated wastewater from being released into the surrounding environment.
Recovery and Neutralization	:	Strict ban on fire. Collect spilled toluene in empty hermetically-sealed containers by making it adsorbed to waste cloth, soil, sand etc. Thoroughly wipe out the spilled toluene.
Secondary Disaster Prevention Measures	:	Mark the restricted area with rope etc. to keep out unauthorized people. Carry out the clean-up operation from the windward and make people on the leeward side evacuate.

7. Handling and Storage

Handling

Engineering Precautions	:	Strictly ban on fire. Avoid contact with high-temperature items, spark and strong oxidizing agents. Handle toluene carefully as it is apt to build up static electricity. Use appropriate personal protective equipment.
Local and General Ventilation	:	Use local ventilation system in indoor handling areas.
Precautions for Safe Handling	:	Avoid rough handling such as turning over, dropping, giving a shock to or dragging containers. Prevent spill, overflow and scattering, and avoid vapor generation. Wash hands, face etc. thoroughly and gargle after handling this reference material. Restrict drinking, eating and smoking to a designated area. Make a place handling this reference material a restricted area to keep out unauthorized people. Use appropriate personal protective equipment to avoid inhalation and contact with eyes, skin and clothing.

Storage

Appropriate Storage Conditions	:	Use explosion-proof electrical devices in storage areas. Ground all the devices. Store this reference material in a light-shielded clean environment at about 5 °C. Strict ban on fire. Do not store this reference material in the vicinity of strong oxidizing substances and ignition sources. Store in a locked area.
Safe Container Packaging Material	:	Glass

8. Exposure Controls/Personal Protection

Cut-Off Value/Concentration Limit

・Working environment assessment criteria	:	20 ppm
Permissible Concentration		
・ACGIH TLV-TWA	:	20 ppm, A4;BEI
・Value recommended by Japan Society for Occupational Health	:	50 ppm, 188 mg/m^3; Percutaneous absorption
・OSHA PEL TWA	:	200 ppm; CL 300; Pk 500/10M
Engineering Controls	:	Facilities to irrigate eyes and wash hands and body must be installed and labeled in the vicinity of a place handling this reference material. Local ventilation system or general ventilation system
・Safety Control/Gas Detection	:	Detector
・Precautions for Storage	:	Ventilation along floor surface
Personal Protective Equipment (PPE)		
・PPE for Respiratory System	:	Mask to avoid organic gas inhalation and oxygen mask
・PPE for Hands	:	Protective gloves
・PPE for Eyes	:	Eye protector
・PPE for Skin and Body	:	Protective clothing
Hygiene Measures	:	Replace adsorbents of masks etc. regularly or in every use. Check rubber part etc. carefully as this reference material attacks rubber etc.

9. Physical and Chemical Properties

・Appearance, etc.	:	Liquid
・Color	:	Clear and colorless
・Odor	:	Characteristic odor
・pH	:	No data
・Melting point	:	−95 °C
・Boiling point	:	110.6 °C
・Flashing point	:	4 °C
・Explosive range	:	1.2 vol% to 7.1 vol% (in the air)
・Vapor pressure	:	49 hPa (30 °C)
・Relative vapor density(Air=1)	:	3.1 (air = 1)
・Specific gravity or bulk specific gravity	:	0.861 to 0.872 (20 °C/20 °C)
・Solubility	:	Insoluble in water (0.05 g/100 mL water, 25 °C) Miscible with ethanol and ether
・*n*-Octanol/water partition coefficient (Log Po/w)	:	2.69
・Auto-ignition temperature	:	480 °C

10. Stability and Reactivity

◇Stability

・Properties changed by light

◇Reactivity

・May generate heat and be ignited when contacting with oxidizing agent

◇Conditions to Avoid

・Sun light, heat, open flame, high temperature, spark, static electricity and other ignition sources

◇Hazardous Decomposition Products

・Carbon monoxide and carbon dioxide

11. Toxicological Information

Acute Toxicity	Oral Rat LD50: 636 mg/kg (RTECS) Inhalation Rat LC50: 49 mg m^{-3}/4 h (RTECS) Dermal Rabbit LD50: 14100 μL/kg (RTECS) Oral: Oral administration to rat: LD50=2,600, 5,500, 5,580, 5,900, 6,400, 7,000 and 7,530 mg/kg (EU-RAR No.30 (2003)) Inhalation: Classified, by applying a formula, based on LC50 (4 hours) of inhalation exposure to rat: 12.5, 28.1, 28.8, 33 mg/L (EU-RAR No.30 (2003)). When using conversion factor (25 °C) of 1 mg/m^3 = 0.265 ppm, LC50 (calculated value) =18 mg/L is calculated to be 4,800 ppm. Saturated vapor pressure concentration (25 °C) is 33,000 ppm when saturated vapor pressure (25 °C) is 3.3 kPa. LC50 of 4,800 ppm, therefore, is found lower than 90% of the saturated vapor pressure concentration. Consequently it is considered to be "vapor with little mist." (NITE)
Skin Corrosion/ Irritation	Skin irritation – Rabbit 20 mg/24 hours Moderate
Serious Eye Damage/ Eye Irritation	Eye irritation – Rabbit 2 mg/24 hours Serious EU-RAR No.30 (2003) describes, based on the results of the eye irritation test performed in accordance with "OECD Test Guideline," that rabbits recover from eye irritation in seven days. It is considered, therefore, that toluene features light eye irritation. (NITE)
Germ Cell Mutagenicity	Chromosome aberration test: Inhalation – Rat 5400 μg m^{-3}/16 weeks – Intermittent administration
Reproductive Toxicity	Human epidemiology study implies increase of spontaneous abortion due to exposure to toluene, dysgenesis/deformity of neonates due to toluene abuse by pregnant women and decrease of luteinizing hormone and testosterone concentration in blood plasma due to exposure to toluene (IRIS Toxicological review (2005)、EU-RAR No.30 (2003)、IARC 71 (1999), IARC 47 (1989), EHC 52 (1986) and ATSDR (2000)).
Specific Target Organ Toxicity/Systemic Toxicity (Single Exposure)	Toluene, which is quickly absorbed by humans mainly through inhalation, acts on central nervous system. Toluene inhalation of 50 ppm - 100 ppm causes fatigue, drowsiness, dizziness and light irritation to respiratory system. Toluene inhalation of 200 ppm-400 ppm causes excitation, accompanied by dysesthesia and nausea. Toluene inhalation of 500 ppm-800 ppm causes central nervous depression, intoxication, obfuscation and toppling gait, etc. ("CERI Hazard Data Collection" 96-4 (1997)). It is also reported that toluene causes irritation to eyes, nose and throat (EU-RAR No.30 (2003)) and that it has narcotic effects on laboratory animals (EU-RAR No.30 (2003)) etc.
Specific Target Organ Toxicity/Systemic Toxicity	Toluene causes drug dependence. It is reported that addicted inhalation causes headache accompanied by visual field constriction or nystagmus and hearing impairment, tremor,

(Repeated Exposure)	ataxia and chronic central nervous disorder such as impairment of memory. Cerebral atrophy is observed in CT test. Renal dysfunctions such as hematuria and proteinuria are also reported ("CERI Hazard Data Collection" 96-4 (1997)). SGOT increase, hepatotoxicity accompanied by fatty degeneration of hepatocyte and lymphocyte infiltration, etc. are reported as well (EU-RAR No.30 (2003)).
Aspiration respiratory hazard	Toluene is hydrocarbon. Kinematic viscosity (calculated value) is 0.65 mm^2/s (25 °C).

12. Ecological Information

Persistence and Degradability

・Degradation: 112 % to 120 % by BOD

Bioaccumulative Potential

・No data available

Ecotoxicity

・Crustacea (brown shrimp)　EC50=3.5 mg L^{-1} /96 hours (EU-RAR (2003))

13. Disposal Considerations

・Dispose this reference material in accordance with applicable legislation and local government ordinance.
・Dispose a container after thoroughly removing its contents.

14. Transport Information

UN Number	:	1294
UN Classification	:	Class 3 (Flammable liquids)
Shipping Name	:	Toluene
Packing Group	:	PG Ⅱ
ICAO/IATA	:	Class 3　Group Ⅱ
Marine Pollutant	:	Not applicable
Precautions	:	Transport this reference material carefully while keeping it away from direct sunlight and paying due attention to avoid accidental release due to dropping and turning over and fire.

15. Regulatory Information

Fire Defense Law

・Dangerous Material Class 4　Class 1 Petroleum (water insoluble)　Danger Rating 2

Poisonous and Deleterious Substances Control Act

・Deleterious Substance　Packing Group 3

Industrial Safety and Health Law

・Article 57 (Enforcement Order: Article 18) Hazardous substance whose name, etc. must be labeled.
・Article 57-2 of the Law　(Article 18-2 of the Order) , Toxic substances of which the names etc. are subject to the notification: No.407, Dangerous/Flammable substance
Ordinance on the Prevention of Organic Solvent Poisoning: Type 2 Organic Solvent

Ship Safety Law

・Flammable Liquids

Act for the Prevention of Marine Pollution and Maritime Disasters
・Enforcement Order Appendix 1 Hazardous Liquid Substance Class Y Substance
Offensive Odor Control Act
・Enforcement Order; Article 1 (Specific Offensive Order Substance)
Narcotic and Psychotropic Drugs Control Act
・Raw material of narcotic and psychotropic drug
Export Trade Control Order
・Appendix 2; No.21-3　Item with export approval
The Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvement to the Management of Thereof
・Specific Type 1 Designated Chemical Substance No.300
◇This SDS is originally prepared for the use of the material in Japan, thus the stated laws and regulations are stipulated and carried out in Japan. The use of the material in other countries should be referred to and by application of the relevant laws and regulations of the country in which the material will be used.

16.Other Information

Others
The information in this document is not intended to be exhaustive and is based on currently available information and data. The measures given in this document are applicable only to normal handling conditions. When handling this reference material under special conditions etc., it is recommended to take safety measures appropriate to each specific application and context of use. This document is intended to provide information and not intended to guarantee anything in handling this reference material.