
SECTION 1: Identification

1.1 GHS Product identifier

Product name 2,4,6-trinitrotoluene

1.2 Other means of identification

Product number -

Other names 1-methyl-2,4,6-trinitrobenzene; trilit; Trinitrotoluene

1.3 Recommended use of the chemical and restrictions on use

Identified uses CBI,Laboratory chemicals,Propellants and blowing agents

Uses advised against no data available

SECTION 2: Hazard identification

2.1 Classification of the substance or mixture

Explosives, Division 1.1

Acute toxicity - Category 3, Oral

Acute toxicity - Category 3, Dermal

Acute toxicity - Category 3, Inhalation

Specific target organ toxicity "repeated exposure, Category 2

Hazardous to the aquatic environment, long-term (Chronic) - Category Chronic 2

2.2 GHS label elements, including precautionary statements

Pictogram(s)



Signal word

Danger

Hazard statement(s)

H201 Explosive; mass explosion hazard

H301 Toxic if swallowed

H311 Toxic in contact with skin

H331 Toxic if inhaled

H373 May cause damage to organs through prolonged or repeated exposure

H411 Toxic to aquatic life with long lasting effects

Precautionary statement(s)

Prevention

P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

P230 Keep wetted with ...

P234 Keep only in original packaging.

P240 Ground and bond container and receiving equipment.

P250 Do not subject to grinding/shock/friction/â€¦.

P280 Wear protective gloves/protective clothing/eye protection/face protection/hearing protection/...

P264 Wash ... thoroughly after handling.

P270 Do not eat, drink or smoke when using this product.

P261 Avoid breathing dust/fume/gas/mist/vapours/spray.

P271 Use only outdoors or in a well-ventilated area.

P260 Do not breathe dust/fume/gas/mist/vapours/spray.

P273 Avoid release to the environment.

Response

P370+P372+P380+P373 In case of fire: Explosion risk. Evacuate area. DO NOT fight fire when fire reaches explosives.

P301+P316 IF SWALLOWED: Get emergency medical help immediately.

P321 Specific treatment (see ... on this label).

P330 Rinse mouth.

P302+P352 IF ON SKIN: Wash with plenty of water/...

P316 Get emergency medical help immediately.

P361+P364 Take off immediately all contaminated clothing and wash it before reuse.

P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.

P319 Get medical help if you feel unwell.

P391 Collect spillage.

Storage

P401 Store in accordance withâ€¦

P405 Store locked up.

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

Disposal

P503 Refer to manufacturer/supplierâ€¦ for information on disposal/recovery/recycling.

P501 Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

2.3 Other hazards which do not result in classification

SECTION 3: Composition/information on ingredients

3.1 Substances

Chemical name	Common names and synonyms	CAS number	EC number	Concentration
2,4,6-trinitrotoluene	2,4,6-trinitrotoluene	118-96-7	204-289-6	100%

SECTION 4: First-aid measures

4.1 Description of necessary first-aid measures

If inhaled

Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.

Following skin contact

Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention . Wear protective gloves when administering first aid.

Following eye contact

First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.

Following ingestion

Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Wear protective gloves when inducing vomiting.

4.2 Most important symptoms/effects, acute and delayed

SYMPTOMS: Symptoms of exposure to this compound may include headache, weakness, anemia, toxic hepatitis, cyanosis, dermatitis, jaundice, purpura, liver injury, conjunctivitis, irritation of the respiratory tract, constriction in the chest, lack of appetite, nausea, vomiting, diarrhea, petechial hemorrhages in the skin, oliguria, albuminuria, casts in urine, papular dermatitis, and yellow-orange discoloration of the hands, nails, face and hair. ACUTE/CHRONIC HAZARDS: This compound can be absorbed through the skin. The vapors are toxic. When heated to decomposition it emits toxic fumes. It will detonate under strong shock or sudden heating. (NTP, 1992)

4.3 Indication of immediate medical attention and special treatment needed, if necessary

Basic treatment: Establish a patent airway (oropharyngeal or nasopharyngeal airway, if needed). Suction if necessary. Watch for signs of respiratory insufficiency and assist ventilations if necessary. Administer oxygen by nonrebreather mask at 10 to 15 L/min. Monitor for pulmonary edema and treat if necessary . Monitor for shock and treat if necessary . Anticipate seizures and treat if necessary . For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with 0.9% saline (NS) during transport . Do not use emetics. For ingestion, rinse mouth and administer 5 ml/kg up to 200 ml of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool. Administer activated charcoal . Aromatic hydrocarbons and related compounds

SECTION 5: Fire-fighting measures

5.1 Suitable extinguishing media

If material on fire or involved in fire: Dangerously explosive. Flood with water. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Trinitrotoluene, wetted or TNT, wetted with not less than 30% water, by mass

5.2 Specific hazards arising from the chemical

Flash point data for this chemical are not available. It is explosive. (NTP, 1992)

5.3 Special protective actions for fire-fighters

Use water in large amounts. Do not attempt to extinguish large fire, evacuate area. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Wet spilled material before picking it up, do not attempt to sweep up dry material. Carefully collect remainder. Then store and dispose of according to local regulations.

6.2 Environmental precautions

Evacuate danger area! Consult an expert! Wet spilled material before picking it up, do not attempt to sweep up dry material. Do NOT wash away into sewer. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment. Personal protection: chemical protection suit including self-contained breathing apparatus.

6.3 Methods and materials for containment and cleaning up

Physical treatments, such as sorption by activated carbon or ion exchange resins or coagulation and filtration, are effective in removing TNT and other related cmpd present in munitions mfg wastewater.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

NO open flames, NO sparks and NO smoking. Do NOT expose to friction or shock. Do not expose to heat and keep wet with at least 30% water. Handling in a well ventilated place. Wear suitable protective clothing. Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Use non-sparking tools. Prevent fire caused by electrostatic discharge steam.

7.2 Conditions for safe storage, including any incompatibilities

Fireproof. Separated from initiator explosives, food and feedstuffs and incompatible materials. See Chemical Dangers. Well closed. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing. Fireproof. Separated from initiator explosives, food and feedstuffs, incompatible materials. See Chemical Dangers. Well closed.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational Exposure limit values

TLV: 0.1 mg/m³, as TWA; (skin); BEI issued. MAK: skin absorption (H); sensitization of skin (SH); carcinogen category: 2; germ cell mutagen group: 3B

Biological limit values

no data available

8.2 Appropriate engineering controls

Ensure adequate ventilation. Handle in accordance with good industrial hygiene and safety practice. Set up emergency exits and the risk-elimination area.

8.3 Individual protection measures, such as personal protective equipment (PPE)

Eye/face protection

Wear face shield or eye protection in combination with breathing protection.

Skin protection

Protective gloves. Protective clothing.

Respiratory protection

Use local exhaust or breathing protection.

Thermal hazards

no data available

SECTION 9: Physical and chemical properties and safety characteristics

Physical state	Solid. Flakes.
Colour	Not darker than Color Number 30257.
Odour	Odorless
Melting point/freezing point	80.4 Å°C. Atm. press.:1 009 hPa.
Boiling point or initial boiling point and boiling range	240Å°C
Flammability	Combustible Solid (Class A Explosive)
Lower and upper explosion limit/flammability limit	no data available
Flash point	167.1Å°C
Auto-ignition temperature	no data available
Decomposition temperature	240Å°C
pH	no data available
Kinematic viscosity	no data available
Solubility	Insoluble (NTP, 1992)
Partition coefficient n-octanol/water	log Pow = 1.65. Temperature:20 Å°C.
Vapour pressure	8.45 Pa. Temperature:85.4 Å°C.;3.96 Pa. Temperature:77.4 Å°C.;1.76 Pa. Temperature:69.9 Å°C.
Density and/or relative density	1.64 kg/mÅ³. Temperature:20 Å°C.;1.64. Temperature:20 Å°C.
Relative vapour density	7.85 (Air = 1)
Particle characteristics	no data available

SECTION 10: Stability and reactivity

10.1 Reactivity

May decompose explosively on shock, friction or concussion. May explode on heating above 240Å°C. Upon heating, toxic fumes are formed. Decomposes on heating. This produces toxic fumes. Reacts violently with many chemicals (seek expert help). This generates fire and explosion hazard.

10.2 Chemical stability

no data available

10.3 Possibility of hazardous reactions

Explosive. Many reactions may cause fire or explosion. TRINITROTOLUENE-TRINITROBENZENE MIXTURE is sensitive to heat and shock. This compound reacts with reducing agents. It will detonate if vigorously shocked or heated to 450Â° F. (NTP, 1992)

10.4 Conditions to avoid

no data available

10.5 Incompatible materials

TNT and potassium hydroxide in methanol will interact even at -65 deg C to give explosive acid-nitro salts (presumably o-quinonoid, or possibly Meisenheimer complexes). The explosion temperature is lowered to 160 deg C by the presence of a little potassium hydroxide.

10.6 Hazardous decomposition products

Heat of decomposition was determined as 5.1 kJ/g.

SECTION 11: Toxicological information

Acute toxicity

- Oral: LD50 - rat (male) - ca. 1 320 mg/kg bw.
- Inhalation: LC50 - rat (male/female) - > 1.01 mg/L air.
- Dermal: no data available

Skin corrosion/irritation

no data available

Serious eye damage/irritation

no data available

Respiratory or skin sensitization

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

CLASSIFICATION: C; possible human carcinogen. BASIS FOR CLASSIFICATION: Evidence of human carcinogenicity is inadequate. Urinary bladder papilloma and carcinoma were observed in female Fischer 344 rats. Mutagenic activity was observed in Salmonella with and without metabolic activation. HUMAN CARCINOGENICITY DATA: None. ANIMAL CARCINOGENICITY DATA: Limited.

Reproductive toxicity

no data available

STOT-single exposure

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the blood. This may result in haemolysis and the formation of methaemoglobin. Exposure could cause death. The effects may be delayed. See Notes. Medical observation is indicated.

STOT-repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver, blood and eyes. This may result in jaundice, anaemia and cataract.

Aspiration hazard

Evaporation at 20Â°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

SECTION 12: Ecological information

12.1 Toxicity

- Toxicity to fish: LC50 - Pimephales promelas - 2.7 mg/L - 96 h.
- Toxicity to daphnia and other aquatic invertebrates: EC50 - Daphnia magna - 9.49 mg/L - 48 h. Remarks: Conc: 0.39; 0.78; 1.56; 3.125; 6.25; 12.5; 25 mg/l.
- Toxicity to algae: EC50 - Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum) - 0.19 mg/L - 72 h.
- Toxicity to microorganisms: IC50 - Vibrio fisheri - > 2.5 - < 4.7 Âµmol/L - 96 h.

12.2 Persistence and degradability

AEROBIC: Mixed cultures of phenol-adapted microorganisms exhibited a slow but significantly higher rate of oxygen uptake in the presence of 2,4,6-trinitrotoluene at concn of 100 mg/L as compared to endogenous respiration, suggesting that 2,4,6-trinitrotoluene is oxidized(1). A treatability study employing static tube runs indicated that 2,4,6-trinitrotoluene can be oxidized at slow rates from 2,4,6-trinitrotoluene waste diluted with the domestic waste of an Army Ammunition plant; however, the rate of bioadsorption or bioprecipitation

was greater than the oxidation rate(2). Activated sludge acclimated to 2,4,6-trinitrotoluene waste for 10 days was used as inoculum for five differing continuous flow runs with 2,4,6-trinitrotoluene concn at 5 mg intervals between 5 and 25 mg/L(2). Fifteen treatability runs of three differing detention times for each concn maintained a 65% average removal efficiency and generally the removal efficiencies tended to decrease with a decrease in detention time and increase in 2,4,6-trinitrotoluene concn(2). A portion of the 2,4,6-trinitrotoluene loss was due to bioadsorption on the activated sludge microorganisms and not due to molecular transformation(3). Composting studies have shown that thermophilic microorganisms produce the same reduction products as mesophilic microbes, no ring cleavage occurs and a large percentage of C14 labeled 2,4,6-trinitrotoluene is bound to the humus fraction(4-6). BOD tests on pure 2,4,6-trinitrotoluene and 2,4,6-trinitrotoluene waste water from the counter current-continuous flow TNT manufacturing process revealed that 2,4,6-trinitrotoluene was oxidized at slow rates(7-8). Attempts to relate BOD to the 2,4,6-trinitrotoluene removed were unsuccessful. It is likely that higher 2,4,6-trinitrotoluene concentrations are toxic to certain oxidizing microorganisms, which may prevent microbial metabolism of 2,4,6-trinitrotoluene(3). Raw sewage was found to be ineffective in degrading 2,4,6-trinitrotoluene, however a sewage sludge digester supernatant liquor caused a 64% reduction in 2,4,6-trinitrotoluene within 6 days(9).

12.3 Bioaccumulative potential

An estimated BCF of 3.4 was calculated in fish for 2,4,6-trinitrotoluene(SRC), using a log Kow of 1.60(1) and a regression-derived equation(2). According to a classification scheme(3), this BCF suggests the potential for bioconcentration in aquatic organisms is low(SRC).

12.4 Mobility in soil

Kp values for 2,4,6-trinitrotoluene sorption on 4 aquatic sediments measured 5.5, 14.3, 16.5 and 22.2 after 24-hr equilibration time, suggesting that the sorption of 2,4,6-trinitrotoluene is low(1). However most of the material absorbed is strongly bound and desorption from sediment is slow(1). Furthermore sorption of 2,4,6-trinitrotoluene increases with increases in pH and temperature(1). Transformation products of 2,4,6-trinitrotoluene may absorb to sediments with the same intensity as 2,4,6-trinitrotoluene(1). Kp values of 5 sediments averaged 53 with a range between 35 and 84(2). According to a classification scheme(3), the corresponding Koc values, which range between 1,100 and 1,900 and average 1,600(2), suggest that 2,4,6-trinitrotoluene is expected to have low mobility in soil. A Kd value of 3.3 L/kg was given for soil from Nebraska Ordinance Plant(4). An average Kd value of 4.0 was determined in 14 different soils(5). Mobility of 2,4,6-trinitrotoluene was enhanced with strong hydrated(Na⁺, Ca⁺) or diminished with weakly hydrated (K⁺) cations(6). 2,4,6-Trinitrotoluenes affinity for phyllosilicates (Kl = 0.496 L/umol) may displace other nitroaromatic compounds effecting its transport through the soil(7). Sorption coefficients for 2,4,6-trinitrotoluene were given in topsoil samples as 6.38 L/kg and in illite as 223.63 L/kg(8). Desorption coefficients for 2,4,6-trinitrotoluene were given for topsoil as 12.01 L/kg and 265.98 L/kg in illite(8). Soil (pH 6.5, 5.3% clay, 1.7% organic matter) containing 11 mg/kg dry soil weight of 2,4,6-trinitrobenzene gave a Kd of 2.9 L/kg and average diffusion rate of 1.18X10⁻⁶ cu cm/sec, indicating slow transportation of 2,4,6-trinitrotoluene through the soil(9).

12.5 Other adverse effects

no data available

SECTION 13: Disposal considerations

13.1 Disposal methods

Product

The material can be disposed of by removal to a licensed chemical destruction plant or by controlled incineration with flue gas scrubbing. Do not contaminate water, foodstuffs, feed or seed by storage or disposal. Do not discharge to sewer systems.

Contaminated packaging

Containers can be triply rinsed (or equivalent) and offered for recycling or reconditioning. Alternatively, the packaging can be punctured to make it unusable for other purposes and then be disposed of in a sanitary landfill. Controlled incineration with flue gas scrubbing is possible for combustible packaging materials.

SECTION 14: Transport information

14.1 UN Number

ADR/RID: UN0209 (For reference only, please check.)	IMDG: UN0209 (For reference only, please check.)	IATA: UN0209 (For reference only, please check.)
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14.2 UN Proper Shipping Name

ADR/RID: TRINITROTOLUENE (TNT), dry or wetted with less than 30% water, by mass€ (For reference only, please check.)	IMDG: TRINITROTOLUENE (TNT), dry or wetted with less than 30% water, by mass€ (For reference only, please check.)	IATA: TRINITROTOLUENE (TNT), dry or wetted with less than 30% water, by mass€ (For reference only, please check.)
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14.3 Transport hazard class(es)

ADR/RID: 1.1D (For reference only, please check.)	IMDG: 1.1D (For reference only, please check.)	IATA: 1.1D (For reference only, please check.)
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14.4 Packing group, if applicable

ADR/RID: (For reference only, please check.)	IMDG: (For reference only, please check.)	IATA: (For reference only, please check.)
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14.5 Environmental hazards

ADR/RID: Yes	IMDG: Yes	IATA: Yes
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14.6 Special precautions for user

no data available

14.7 Transport in bulk according to IMO instruments

no data available

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations specific for the product in question

Chemical name	Common names and synonyms	CAS number	EC number
2,4,6-trinitrotoluene	2,4,6-trinitrotoluene	118-96-7	204-289-6
European Inventory of Existing Commercial Chemical Substances (EINECS)			Listed.
EC Inventory			Listed.
United States Toxic Substances Control Act (TSCA) Inventory			Listed.
China Catalog of Hazardous chemicals 2015			Listed.
New Zealand Inventory of Chemicals (NZIoC)			Listed.
Philippines Inventory of Chemicals and Chemical Substances (PICCS)			Listed.
Vietnam National Chemical Inventory			Listed.
Chinese Chemical Inventory of Existing Chemical Substances (China IECSC)			Listed.
Korea Existing Chemicals List (KECL)			Listed.

SECTION 16: Other information

Information on revision

Creation Date July 15, 2019
Revision Date July 15, 2019

Abbreviations and acronyms

- CAS: Chemical Abstracts Service
- ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road
- RID: Regulation concerning the International Carriage of Dangerous Goods by Rail
- IMDG: International Maritime Dangerous Goods
- IATA: International Air Transportation Association
- TWA: Time Weighted Average
- STEL: Short term exposure limit
- LC50: Lethal Concentration 50%
- LD50: Lethal Dose 50%
- EC50: Effective Concentration 50%

References

- IPCS - The International Chemical Safety Cards (ICSC), website: <http://www.ilo.org/dyn/icsc/showcard.home>
- HSDB - Hazardous Substances Data Bank, website: <https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm>
- IARC - International Agency for Research on Cancer, website: <http://www.iarc.fr/>
- eChemPortal - The Global Portal to Information on Chemical Substances by OECD, website: http://www.echemportal.org/echemportal/index?pageID=0&request_locale=en
- CAMEO Chemicals, website: <http://cameochemicals.noaa.gov/search/simple>
- ChemIDplus, website: <http://chem.sis.nlm.nih.gov/chemidplus/chemidlite.jsp>
- ERG - Emergency Response Guidebook by U.S. Department of Transportation, website: <http://www.phmsa.dot.gov/hazmat/library/erg>
- Germany GESTIS-database on hazard substance, website: <http://www.dguv.de/ifa/gestis/gestis-stoffdatenbank/index-2.jsp>
- ECHA - European Chemicals Agency, website: <https://echa.europa.eu/>

Other Information

Combustion in a confined space may turn into detonation. Depending on the degree of exposure, periodic medical examination is suggested. Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. Do NOT take working clothes home.