REAGENTS DUKSAN

SAFETY DATA SHEET

According to OSHA Hazcom Standard 29 CFR 1910.1200

Oxidizer

Date of issue: 2022-06-15 **Revision date: 2023-06-29** **Version: 3.0**

1. IDENTIFICATION

A. Product name

- Oxidizer

B. Recommended use and restriction on use

- General use : for experimental, research and industrial use
- Restriction on use : Never drink, Not used except for experimental, research and industrial applications.

C. Manufacturer / Supplier / Distributor information

○ **Manufacturer information**

- Company name : DUKSAN PURE CHEMICALS
- Address : 53,SINWONRO 133BEONGIL, DANWONGU, ANSANSHI, GYUNGGIDO, KOREA
- Emergency telephone number : 82-31-495-4055

○ **Supplier/Distributer information**

- Company name : DUKSAN PURE CHEMICALS
- Address : 53,SINWONRO 133BEONGIL, DANWONGU, ANSANSHI, GYUNGGIDO, KOREA
- Emergency telephone number : 82-31-495-4055

2. HAZARD IDENTIFICATION

A. GHS Classification

- Flammable liquids : Category2
- Acute toxicity (oral) : Category4
- Serious eye damage/irritation : Category1
- Carcinogenicity : Category2
- Specific target organ toxicity(Single exposure) : Category3(Respiratory tract irritation)

B. GHS label elements

○ **Hazard symbols**



○ **Signal words**

- Danger

○ **Hazard statements**

- H225 Highly flammable liquid and vapour
- H302 Harmful if swallowed
- H318 Causes serious eye damage
- H335 May cause respiratory irritation.
- H351 Suspected of causing cancer

○ **Precautionary statements**

1) Prevention

- P201 Obtain special instructions before use.
- P202 Do not handle until all safety precautions have been read and understood.
- P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
- P233 Keep container tightly closed.
- P240 Ground and bond container and receiving equipment.

- P241 Use explosion-proof electrical/ventilating/lighting/equipment.
- P242 Use non-sparking tools.
- P243 Take action to prevent static discharges.
- P261 Avoid breathing dust/fume/gas/mist/vapours/spray.
- P264 Wash hands thoroughly after handling.
- P270 Do not eat, drink or smoke when using this product.
- P271 Use only outdoors or in a well-ventilated area.
- P280 Wear protective gloves/protective clothing/eye protection/face protection/hearing protection.

2) Response

- P301+P312 IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
- P303+P361+P353 IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.
- 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.
- P310 Immediately call a POISON CENTER or doctor/physician.
- P312 Call a POISON CENTER or doctor/physician if you feel unwell.
- P330 Rinse mouth.
- P370+P378 In case of fire: Use Suitable extinguishing media for extinction(Refer Section MSDS 5).

3) Storage

- P403+P233 Store in a well-ventilated place. Keep container tightly closed.
- P403+P235 Store in a well-ventilated place. Keep cool.
- P405 Store locked up.

4) Disposal

- P501 Dispose of contents/container in accordance with local/regional/national/international regulation

C. Other hazards which do not result in classification

- Not available

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	Trade names and Synonyms	CAS No.	Content(%)
Tetrahydrofuran	Butane alpha, delta-oxide ; Diethylene oxide ; Hydrofuran ; Furanidine ; Oxolane ; Tetramethylene oxide ; 1,4-Epoxybutane ; Oxacyclopentane ; Cyclotetramethylene oxide ;	109-99-9	84 ~ 94
Water	Dihydrogen oxide ; Oxidane	7732-18-5	5 ~ 15
Pyridine	Pyridine ; Ai3-01240 ; Azabenzene ; Azine ; Cp 32 ; Pesticide Code: 069202 ; Fema Number 2966 ; Nci-C55301 ; Piridina (italian) ; Pirydyna (polish) ; Pyridin (german)	110-86-1	<1
Iodine	Diiodine ; Eranol ;	7553-56-2	<1

4. FIRST AID MEASURES

A. Eye contact

- Do not rub your eyes.
- Immediately flush eyes with plenty of water for at least 15 minutes and call a doctor/physician.
- Get medical attention immediately.
- Remove contact lenses if worn.

B. Skin contact

- Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
- Wash contaminated clothing thoroughly before re-using.
- Get medical attention immediately.

C. Inhalation contact

- Take specific treatment if needed.
- When exposed to large amounts of steam and mist, move to fresh air.
- Get medical attention immediately.
- If breathing is stopped or irregular, give artificial respiration and supply oxygen.

D. Ingestion contact

- Please be advised by doctor whether induction of vomit is demanded or not.
- Rinse your mouth with water immediately.
- Get medical attention immediately.

E. Delayed and immediate effects and also chronic effects from short and long term exposure

- Not available

F. Notes to physician

- Notify medical personnel of contaminated situations and have them take appropriate protective measures.
- If exposed or concerned, get medical attention/advice.

5. FIREFIGHTING MEASURES

A. Suitable (Unsuitable) extinguishing media

- Avoid use of water jet for extinguishing
- Dry chemical, carbon dioxide, regular foam extinguishing agent, spray

B. Specific hazards arising from the chemical

- Causes serious eye damage
- Harmful if swallowed
- Highly flammable liquid and vapour
- May cause respiratory irritation.
- Suspected of causing cancer

C. Special protective actions for firefighters

- Avoid inhalation of materials or combustion by-products.
- Cool containers with water until well after fire is out.
- Do not approach the tank surrounded by fire until it is extinguished.
- In case of conflagration, use automatic fire sprinkler. Major fire may require withdrawal, allowing the object itself to burn.
- Keep unauthorized personnel out.

6. ACCIDENTAL RELEASE MEASURES

A. Personal precautions, protective equipment and emergency procedures

- Do not touch spilled material. Stop leak if you can do it without risk.
- Handle the damaged containers or spilled material after wearing appropriate protective equipment
- Move container to safe area from the leak area.
- Must work against the wind, let the upwind people to evacuate.
- Remove all sources of ignition.

B. Environmental precautions

- If large amounts have been spilled, inform the relevant authorities.
- Prevent runoff and contact with waterways, drains or sewers.

C. Methods and materials for containment and cleaning up

- Appropriate container for disposal of spilled material collected.
- Dike for later disposal.
- Disposal of waste shall be in compliance with the Wastes Control Act
- Large spill : Stay upwind and keep out of low areas. Dike for later disposal.
- Notify the central and local government if the emission reach the standard threshold.

7. HANDLING AND STORAGE

A. Precautions for safe handling

- Avoid contact with incompatible materials.
- Avoid direct physical contact.
- Comply with all applicable laws and regulations for handling
- Dealing only with a well-ventilated place.

- Do not handle until all safety precautions have been read and understood.

B. Conditions for safe storage, including any incompatibilities

- Avoid direct sunlight.
- Check regularly for leaks.
- Do not apply any physical shock to container.
- Do not apply direct heat.
- Do not use damaged containers.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

A. Exposure limits

○ **ACGIH TLV**

- [Tetrahydrofuran] : TWA 50 ppm (147 mg/m3) STEL 100 ppm (295 mg/m3) Skin
- [Pyridine] : TWA 1 ppm (3.1 mg/m3)
- [Iodine] : TWA, 0.01 ppm (0.1 mg/m3)-Iodine and iodides as inhalable Fraction and Vapor STEL, 0.1 ppm (1 mg/m3) - Iodine Vapor

○ **OSHA PEL**

- [Tetrahydrofuran] : 590
- [Pyridine] : 15
- [Iodine] : (C) 1

B. Engineering controls

- Business owner is recommended to maintain below recommended exposure limits for the working place with general exhaust of gas/vapour/mist/fume.

C. Individual protection measures, such as personal protective equipment

○ **Respiratory protection**

- Any air-purifying respirator with a full facepiece and an organic vapor canister.
- Any chemical cartridge respirator with a full facepiece and organic vaporcartridge(s).
- Any chemical cartridge respirator with organic vapor cartridge(s).
- Consider warning properties before use.
- For Unknown Concentration or Immediately Dangerous to Life or Health : Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply. Any self-contained breathing apparatus with a full facepiece.
- Respiratory protection is ranked in order from minimum to maximum.
- Under conditions of frequent use or heavy exposure, Respiratory protection may be needed.

○ **Eye protection**

- Provide an emergency eye wash station and quick drench shower in the immediate work area.
- Wear primary eye protection such as splash resistant safety goggles with a secondary protection face shield.

○ **Hand protection**

- Wear appropriate chemical resistant glove.

○ **Skin protection**

- Wear appropriate chemical resistant protective clothing.

○ **Others**

- Not available

9. PHYSICAL AND CHEMICAL PROPERTIES

A. Appearance	
- Appearance	Liquid
- Color	Not available
B. Odor	Not available
C. Odor threshold	Not available
D. pH	Not available
E. Melting point/Freezing point	Not available
F. Initial Boiling Point/Boiling Ranges	Not available
G. Flash point	-21.5 (Estimate)
H. Evaporation rate	Not available
I. Flammability(solid, gas)	Not available

J. Upper/Lower Flammability or explosive limits	Not available
K. Vapour pressure	Not available
L. Solubility	Not available
M. Vapour density	Not available
N. Specific gravity(Relative density)	0.8892 (Estimate)
O. Partition coefficient of n-octanol/water	Not available
P. Autoignition temperature	Not available
Q. Decomposition temperature	Not available
R. Viscosity	Not available
S. Molecular weight	Not available

10. STABILITY AND REACTIVITY

A. Chemical Stability

- This material is stable under recommended storage and handling conditions.

B. Possibility of hazardous reactions

- Cylinders exposed to fire may vent and release flammable gas.

C. Conditions to avoid

- Avoid : Accumulation of electrostatic charges, Heating, Flames and hot surfaces
- Avoid contact with incompatible materials and condition.
- Avoid contact with heat, sparks, flame or other ignition sources.

D. Incompatible materials

- Not available

E. Hazardous decomposition products

- May emit flammable vapour if involved in fire.

11. TOXICOLOGICAL INFORMATION

A. Information on the likely routes of exposure

○ **Respiratory tracts**

- May cause respiratory irritation.

○ **Oral**

- Harmful if swallowed

○ **Eye·Skin**

- Causes serious eye damage

B. Delayed and immediate effects and also chronic effects from short and long term exposure

○ **Acute toxicity**

*** Oral**

- Product (ATEmix) : 300mg/kg < ATEmix <= 2000mg/kg
- [Tetrahydrofuran] : LD50 1650 mg/㎏ (ECHA)
- [Water] : LD50 > 90000 ㎎/㎏ Rat (LD50 > 90 ml/kg) (HSDB)
- [Pyridine] : LD50 891 ㎎/㎏ (NLM)
- [Iodine] : LD50 315 ㎎/㎏ Rat(ECHA)

*** Dermal**

- Product (ATEmix) : 2000mg/kg < ATEmix <= 5000mg/kg
- [Tetrahydrofuran] : LD50 >2000 ㎎/㎏ Rat (OECD TG 402) (ECHA)
- [Pyridine] : LD50 1121 ㎎/㎏ Rabbit (NLM)
- [Iodine] : LD50 1425 ㎎/㎏ Rabbit (EPA Pesticide(2006))(ECHA)

*** Inhalation**

- Product (ATEmix) : 20.0mg/L < ATEmix <= 50.0mg/L
- [Tetrahydrofuran] : LC50 >14.7 ㎎/ℓ 6 hr Rat (US EPA, GLP)
- [Pyridine] : Steam LC50 12.898 ㎎/ℓ 4 hr Rat 15.8 mg/L (NITE)
- [Iodine] : Vapor LC50 > 4588 ㎎/ℓ 4 hr Rat (OECD TG 403, GLP)

○ **Skin corrosion/irritation**

- Not available

○ **Serious eye damage/irritation**

- Causes serious eye damage

○ **Respiratory sensitization**

- Not available

○ **Skin sensitization**

- Not available

○ **Carcinogenicity**

*** IARC**

- [Tetrahydrofuran] : Group 2B
- [Pyridine] : Group 2B

*** OSHA**

- Not available

*** ACGIH**

- [Tetrahydrofuran] : A3
- [Pyridine] : A3
- [Iodine] : A4

*** NTP**

- Not available

*** EU CLP**

- Not available

○ **Germ cell mutagenicity**

- Not available

○ **Reproductive toxicity**

- Not available

○ **STOT-single exposure**

- May cause respiratory irritation.

○ **STOT-repeated exposure**

- Not available

○ **Aspiration hazard**

- Not available

12. ECOLOGICAL INFORMATION

A. Ecotoxicity

○ **Fish**

- [Tetrahydrofuran] : LC50 2160 ㎎/ℓ 96 hr Pimephales promelas (Flow-throuth, OECD Guideline 203) (ECHA)
- [Pyridine] : LC50 26 ㎎/ℓ 96 hr LC50 99 ㎎/ℓ 96 hr Pimephales promelas(Method described by Broderius & Kahl 1985; non-guideline study) (ECHA)
- [Iodine] : LC50 1.67 ㎎/ℓ 96 hr Oncorhynchus mykiss (ECHA)

○ **Crustaceans**

- [Tetrahydrofuran] : LC50 3485 ㎎/ℓ 48 hr Daphnia magna(OECD TG 202) (ECHA)
- [Pyridine] : EC50 320 ㎎/ℓ 48 hr Daphnia magna(OECD Guideline 202, GLP) (ECHA)
- [Iodine] : LC50 0.55 ~ 0.59 ㎎/ℓ 48 hr Daphnia magna (ECHA)

○ **Algae**

- [Pyridine] : EC50 0.069 ㎎/ℓ (24-72hr) (NITE) EC50 320 ㎎/ℓ 72 hr Selenastrum capricornutum(Read-across: 108-99-6, 3-methylpyridine, OECD Guideline 201, GLP) (ECHA)
- [Iodine] : EC50 0.13 ㎎/ℓ 72 hr (Test species: Desmodesmus subspicatus, OECD TG 201, GLP) (ECHA)

B. Persistence and degradability

○ **Persistence**

- [Tetrahydrofuran] : log Kow 0.45 (25°C, OECD TG 107) (ECHA)
- [Water] : log Kow = -1.38 (HSDB)
- [Pyridine] : log Kow 0.65 (ICSC)

○ **Degradability**

- Not available

C. Bioaccumulative potential

○ **Bioaccumulative potential**

- Not available

○ **Biodegradation**

- [Tetrahydrofuran] : 39 % 28 day (OECD TG 301 D) (ECHA)
- [Pyridine] : BOD: 62 (%) (NITE)

D. Mobility in soil

- [Tetrahydrofuran] : Koc 18.33 ~ 23.32 (ECHA)
- [Pyridine] : Koc 71.72 (ECHA)
- [Iodine] : Kd 0.13, (20℃) (ECHA)

E. Other adverse effects

- [Tetrahydrofuran] : Fish(Pimephales promelas): NOEC(33d) 216mg/L (Flow-throuth) (ECHA)
- [Pyridine] : Algae(Chlorella vulgaris): IC50(14d, chlorophyll) 0.06 (other: % ,v/v), IC50(14d, total protein) 0.083 (other: % ,v/v), IC50(14d, biomass) 0.102 (other: % ,v/v) (ECHA)

13. DISPOSAL CONSIDERATIONS

A. Disposal methods

- It shall be treated by incineration
- Oil water separation technology shall be applied as pre-waste treatment if it is applicable
- Stabilization and minimization treatment by incineration or similar method can be applied, if more than two kinds of designated wastes are in mixture state and it is impractical to separate them

B. Special precautions for disposal

- Anyone with business license number who generates industrial wastes shall treat the waste by him/herself or by entrusting to the legal entities who treat the wastes, recycle the wastes of others or install and operate the waste treatment facilities according to the Wastes Control Act

- Dispose of waste in accordance with all applicable laws and regulations.

14. TRANSPORT INFORMATION

A. UN No. (IMDG CODE/IATA DGR)

- 2056

B. Proper shipping name

- TETRAHYDROFURAN SOLUTION

C. Hazard Class

- 3

D. IMDG CODE/IATA DGR Packing group

- II

E. Marine pollutant

- Not applicable

F. Special precautions for user related to transport or transportation measures

- Local transport follows in accordance with Dangerous goods Safety Management Law.
- Package and transport follow in accordance with Department of Transportation (DOT) and other regulatory agency requirements.
- EmS FIRE SCHEDULE : F-E (Non-water-reactive flammable liquids)
- EmS SPILLAGE SCHEDULE : S-D (Flammable liquids)

15. REGULATORY INFORMATION

A. National and/or international regulatory information

○ **POPs Management Law**

- [Tetrahydrofuran] : Not applicable
- [Water] : Not applicable
- [Pyridine] : Not applicable
- [Iodine] : Not applicable

○ **Information of EU Classification**

*** Classification**

- [Tetrahydrofuran] : H225,H319,H335,H351
- [Pyridine] : H225,H302,H312,H332
- [Iodine] : H312,H332,H400

○ **U.S. Federal regulations**

*** OSHA PROCESS SAFETY (29CFR1910.119)**

- Not applicable

*** CERCLA Section 103 (40CFR302.4)**

- [Tetrahydrofuran] : 453.599 kg 1000 lb
- [Pyridine] : 453.599 kg 1000 lb

*** EPCRA Section 302 (40CFR355.30)**

- Not applicable

*** EPCRA Section 304 (40CFR355.40)**

- Not applicable

*** EPCRA Section 313 (40CFR372.65)**

- [Pyridine] : Applicable

○ **Rotterdam Convention listed ingredients**

- Not applicable

○ **Stockholm Convention listed ingredients**

- Not applicable

○ **Montreal Protocol listed ingredients**

- Not applicable

16. OTHER INFORMATION

A. Reference

- The information contained herein is believed to be accurate. It is provided independently of any sale of the product for purpose of hazard communication. It is not intended to constitute performance information concerning the product. No express warranty, or implied warranty of merchantability or fitness for a particular purpose is made with respect to the product or the information contained herein.

- This Safety Data Sheet was compiled with data and information from the following sources: KOSHA, NITE, ESIS, NLM, SIDS, IPCS

B. Issue date

- 2022-06-15

C. Revision number and Last date revised

- 2 times, 2023-06-29

D. Other

- This SDS is prepared according to the Globally Harmonized System (GHS).