Hanwha Solutions

# SAFETY DATA SHEET

**Date Printed:** January 17, 2024
**Version:** 13
**Regulation:** According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

## 1. Identification

### 1.1 Product identifier

**1.1.1 Product name:** KONNATE o-TDA
**1.1.2 Other means of identification:** 3(or 4) toluene-1,2-diamine

### 1.2 Recommended use of the chemical and restrictions on use

**1.2.1 Recommended use:** Polyol, Antioxidant, Anticorrosive agent, dyes. etc.
**1.2.2. Restrictions on use:** Since the oxidation occurs in the air, it must be minimized contact with air.

### 1.3 Details of the supplier of the safety data sheet

**1.3.1 Manufacturer**
Company name: TDI Plant, Hanwha Solutions Co, Ltd.
Address: 46-47, Yeosusandan 2-ro, Yeosu-si, Jeollanam-do, Korea
Prepared by: TDI Production Team
Contact Telephone: +82-61-688-4888 / Fax: +82-61-688-4869
**1.3.2 Supplier & Distributor**
Company name: Hanwha Solutions Co, Ltd.
Address: Hanwha Bldg., Janggyo-dong, Jung-gu, Seoul, Korea
Prepared by: FM Sales Team
Contact Telephone: +82-2-729-2970 / Fax: +82-2-729-5347

### 1.4 Emergency phone number

Emergency phone: +82-2-729-2970
TEL: 1-800-424-9300, +1 703-527-3887, +1 713-402-1990 (Any problems that occurred in U.S.A)

## 2. Hazard(s) identification

### 2.1 Classification of the substance or mixture

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

**Physical / Chemical Hazards:** Not classified

**Health Hazards:**
Acute toxicity (oral): Category 4
Acute toxicity (dermal) Category 4
Skin sensitization: Category 1
Germ cell mutagenicity: Category 2
Carcinogenicity: Category 1B
Reproductive toxicity: Category 2

**Environmental Hazards:**
Hazardous to the aquatic environment (Acute hazard): Category 1
Hazardous to the aquatic environment (Chronic hazard): Category 1

### 2.2 Label elements, including precautionary statements

**o Pictogram and symbol**:

**o Signal word:** Danger
**o Hazard statements:**
H302 Harmful if swallowed.
H312 Harmful in contact with skin.
H317 May cause an allergic skin reaction.
H341 Suspected of causing genetic defects.
H350 May cause cancer (oral).
H361 Suspected of damaging fertility or the unborn child (oral).
H400 Very toxic to aquatic life.
H410 Very toxic to aquatic life with long lasting effects.
**o Precautionary statements:**
**- Prevention:**
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P261 Avoid breathing dust/fume/gas/mist/vapors/spray.
P264 Wash your hands thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P272 Contaminated work clothing should not be allowed out of the workplace.
P273 Avoid release to the environment.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
**- Treatment:**
P301+P312 If swallowed: Call a poison center or doctor/physician if you feel unwell.
P302+P352 If on skin: Wash with plenty of soap and water.
P308+P313 If exposed or concerned: Get medical advice/ attention.
P312 Call a poison center or doctor/physician you feel unwell.
P321 Specific treatment (see Section 8 on this label).
P330 Rinse mouth.
P333+P313 If skin irritation or rash occurs: Get medical advice/attention.
P363 Wash contaminated clothing before reuse.
P391 Collect spillage.
**- Storage:**
P405 Store locked up.
**- Disposal:**
P501 Dispose the contents/container in accordance with local/regional/national/international regulations.

### 2.3 Other hazard information not included in hazard classification (National Fire Protection Association; NFPA)


**o Health:** 2
**o Flammability:** 1
**o Reactivity:** 1
**o Specific hazard:** -

## 3. Composition/information on ingredients

| Component | Common name and synonyms | CAS No. | Conc. / % |
|---|---|---|---|
| 3(or 4)-Methylbenzene-1,2-diamine | Ortho Toluene Diamine | 26966-75-6 | 100 |
| Toluene-2,3-diamine | | 2687-25-4 | 40±5 |
| Toluene-3,4-diamine | | 496-72-0 | 60±5 |

## 4. First aid measures

### 4.1 Description of first aid measures

**Eye contact**

- Call emergency medical service.
- In case of contact with substance, immediately flush skin, or eyes with running water for at least 20 minutes.

**Skin contact**

- If skin irritation or rash occurs: Get medical advice/attention.
- Wash contaminated clothing before reuse.
- For hot product, immediately immerse in or flush the affected area with large amounts of cold water to dissipate heat.
- Call emergency medical service.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin, or eyes with running water for at least 20 minutes.
- For minor skin contact, avoid spreading material on unaffected skin.

**Inhalation**

- If exposed or concerned: Get medical advice/ attention.
- Move victim to fresh air.
- Keep victim warm and quiet.

**Ingestion**

- If exposed or concerned: Get medical advice/ attention.
- Rinse mouth
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or others proper respiratory medical device.

### 4.2 Most important symptoms and effects, both acute and delayed acute effects

- None known.

### 4.3 Indication of immediate medical attention and notes for physician

- Exposures require specialized first aid with contact and medical follow-up.
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

## 5. Fire-fighting measures

### 5.1 Extinguishing media

- Suitable extinguishing media: alcohol foam, carbon dioxide, or water spray
- Use dry sand or earth to smother fire.
- Unsuitable extinguishing media: Not available

### 5.2 Specific hazards arising from the chemical

- May decompose at high temperatures into forming toxic gases.
- Containers may explode when heated.
- Some of these materials may burn, but none ignite readily.
- Non-combustible, substance itself does not burn but may decompose upon heating, then produce corrosive and/or toxic fumes.

### 5.3 Special protective equipment and precautions for fire-fighters

- Rescuers should put on appropriate protective gear.
- Evacuate area and fight fire from a safe distance.
- Substance may be transported in a molten form.
- Some may be transported hot.
- Dike fire-control water for later disposal; do not scatter the material.

- Move containers from fire area if you can do it without risk.
- Fire involving Tanks; Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Fire involving Tanks; Cool containers with flooding quantities of water until well after fire is out.
- Fire involving Tanks; Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- Fire involving Tanks; Always stay away from tanks engulfed in fire.
- Fire involving Tanks; For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

## 6. Accidental release measures

### 6.1 Personal precautions, protective equipment, and emergency procedures

- Avoid breathing dust/fume/gas/mist/vapors/spray.
- Clean up spills immediately, observing precautions in Protective Equipment section.
- Isolate hazard area.
- Keep unnecessary and unprotected personnel from entering.
- Eliminate all ignition sources.
- Stop leak if you can do it without risk.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Cover with plastic sheet to prevent spreading.
- Prevent dust cloud.
- Please note that there are materials and conditions to avoid.

### 6.2 Environmental precautions

- Avoid release to the environment.
- Prevent entry into waterways, sewers, basements, or confined areas.

### 6.3 Methods and materials for containment and cleaning up

- Collect spillage.
- Absorb spills with inert material (e.g., dry sand or earth), then place in a chemical waste container.
- Absorb the liquid and scrub the area with detergent and water.
- Large spill; Dike far ahead of liquid spill for later disposal.
- With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
- Powder Spill; Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.
- Small Spill; Take up with sand or other non-combustible absorbent material and place into containers for later disposal.

## 7. Handling and storage

### 7.1 Precautions for safe handling

- Do not handle until all safety precautions have been read and understood.
- Avoid breathing dust/fume/gas/mist/vapors/spray.
- Wash your hands thoroughly after handling.
- Do not eat, drink, or smoke when using this product.
- Contaminated work clothing should not be allowed out of the workplace.
- Follow all SDS/label precautions even after container is emptied because they may retain product residues.
- Use carefully in handling/storage.
- Loosen closure cautiously before opening.
- Avoid prolonged or repeated contact with skin.
- Do not enter storage area unless adequately ventilated.
- Please note that there are materials and conditions to avoid.
- Be careful to high temperature.

### 7.2 Conditions for safe storage, including any incompatibilities

- Store locked up.
- Empty drums should be completely drained, properly bunged, and promptly returned to a drum reconditioner, or properly disposed of.
- Keep away from food and drinking water.

## 8. Exposure controls/personal protection

### 8.1 Occupational Exposure limits

- **ACGIH**: Not available
- **Biological exposure index**: Not available
- **OSHA**: Not available
- **NIOSH**: Not available
- **EU regulation**: Not available
- **Other**: Not available

### 8.2 Exposure controls

**Appropriate engineering controls**

- Provide good general ventilation (typically 10 ventilations per hour).
- Adjust the ventilation speed to suit the conditions.
- Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.
- If no exposure limits have been established, keep the air level at an acceptable level.

**Individual protection measures, such as personal protective equipment**

**Respiratory protection**

- Wear NIOSH or approved full or half face piece (with goggles) respiratory protective equipment when necessary.
- In lack of oxygen (< 19.5%), wear the supplied-air respirator or self-contained breathing apparatus oxygen.

**Eye protection**

- Wear breathable safety goggles to protect from particulate material causing eye irritation or other disorder.
- An eye wash unit and safety shower station should be available nearby workplace.

**Hand protection**

- Wear appropriate protective gloves by considering physical and chemical properties of chemicals.

**Body protection**

- Wear appropriate resistant protective clothing by considering physical and chemical properties of chemicals.

## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

| | |
|---|---|
| **Appearance** | |
| **Description:** | Solid (room temperature) |
| **Color:** | Brown |
| **Odor:** | Pungent |
| **Odor threshold:** | Not available |
| **pH:** | Not applicable |
| **Melting point/freezing point:** | 61~92°C |
| **Initial boiling point and boiling range:** | 250~270°C |
| **Flash point:** | 172.5 °C |
| **Evaporation rate:** | Not available |

| | |
|---|---|
| **Flammability (solid, gas):** | Not available |
| **Upper/lower flammability or explosive limits:** | Not available |
| **Vapor pressure:** | 2 mmHg (100 °C) |
| **Vapor density:** | Not available |
| **Specific gravity** | 1.045 g/mL (20 °C) |
| **Solubility:** | 2.69 g/L (20 °C) |
| **Solubility in organic solvents:** | Not available |
| **Partition coefficient: n-octanol/water:** | $\log K_{ow}$=0.66 (20 °C) |
| **Auto ignition temperature:** | Not available |
| **Decomposition temperature:** | Not available |
| **Viscosity:** | 5 cPs (100 °C) |

"NOTE: The physical data presented above are typical values and should not be construed as a specification"

## 10. Stability and reactivity

**10.1 Reactivity/Chemical stability/Possibility of hazardous reactions**
- May decompose at high temperatures into forming toxic gases.
- Containers may explode when heated.
- Some of these materials may burn, but none ignite readily.
- Non-combustible, substance itself does not burn but may decompose upon heating, then produce corrosive and/or toxic fumes.
- Stable(at room temperature and pressure)
- Not polymerisation

**10.2 Conditions to avoid:**
- Heat, sparks, or flames
- Store in places out of water supplies and sewers.
- Please suppressing the generation of dust.

**10.3 Incompatible materials:**
- Combustibles, reducing agents
- Strong acid, Strong oxidizing agent.

**10.4 Hazardous decomposition products:**
- Corrosive and/or toxic fume
- Irritating, corrosive and/or toxic gases
- Thermal decomposition products: nitrogen oxide

## 11. Toxicological information

| **Information on toxicological effects** | |
|---|---|
| (a) Acute toxicity | |
| Oral | Category 4 |
| | Rat, $LD_{50}$ = 660 mg/kg bw (OECD TG 401) |
| Dermal | Category 4 |
| | Rabbit, $LD_{50}$ = 1,120 mg/kg bw (EPA OPP 81-2) |
| Inhalation | Not classified |
| | Rat; inhalation: vapor; 4h-$LCL_0$ > 670 ppm, no deaths |
| (b) Skin Corrosion/ Irritation | Not classified |
| | No to slight erythema of 72 hours and slight edema for 24 hours. Primary |

| | |
|---|---|
| | irritation index (PDII) obtained equaled 1.25. (Code of Federal Regulations section 1500.41) |
| (c) Serious Eye Damage/ Irritation | Not classified |
| | Slight conjunctival redness was produced in all animals at 2, 24 and 48 hours after instillation of the test material. Two of the six animals exhibited a slight reddening of the iris at 24 hours. No irritation remained in any animal at 72 hours. (Code of federal Regulations vol 36 title 16, Section 1500.42, 1973.) |
| (d) Respiratory sensitization | Not available |
| (e) Skin Sensitization | Category 1 |
| | The study found TDA to be weakly sensitizing to skin in this model with an EC3 of 19%. (2,4-TDA, CAS No. 25376-45-8) (OECD TG 429) |
| (f) Carcinogenicity | Category 1B (oral) |
| | - In a carcinogenicity study F344 rats were administered with feeding concentrations of 0, 125/50 and 250/100 ppm 2,4 -TDA over a period of up to 103 weeks. The time-weighted average dose was 79 ppm for the low-dose males and females for 103 weeks, 176 ppm for the high-dose males for 79 weeks, and 171 ppm for the high-dose females for 84 weeks. The calculated average intake of 2,4-TDA was approx. 5.9 mg/kg bw/day (low dose) and approx. 13 mg/kg bw/day (high dose). In this study 2,4-TDA was clearly carcinogenic for F344 rats, inducing proliferative hepatic findings and hepatocellular carcinomas in both sexes. It induced a high incidence of benign and malignant tumors of the mammary gland in females. In summary of the statistical findings, the incidences of fibromas of the subcutaneous tissue in male rats are associated with 2,4-TDA administration. (2,4-TDA, CAS No. 95-80-7) (OECD TG 451)<br>- EU CLP 1272/2008: Carc. 1B |
| (g) Mutagenicity | Category 2 |
| | *In vitro*: Bacterial Reverse Mutation Assay: positive (3,4-TDA, CAS 496-72-0) (OECD TG 471)<br>*In vitro*: Mammalian cell gene mutation assay: positive (3,4-TDA, CAS 496-72-0) (OECD TG 476)<br>*In vivo*: Mammalian Erythrocyte Micronucleus Test: positive (OECD TG 474, GLP)<br>*In vivo*: Rodent dominant lethal assay: negative (2,4-TDA, CAS No. 95-80-7) (OECD TG 478) |
| (h) Reproductive toxicity | Category 2 (oral) (impaired fertility) |
| | - Effects of 2,4-toluenediamine (TDA) on reproduction in adult male Sprague-Dawley rats were evaluated. Diets containing 0, 0.01 and 0.03% TDA were fed ad libitum to experimental animals for 10 weeks. No signs of toxicity were found. Exposure to the high dose resulted in decreased mating frequency and an increase in infertile matings. Light-microscopic examination of the testes revealed reduced numbers of sperm in the seminiferous tubules and cauda epididymides. These results indicate that TDA is capable of reducing fertility and of exerting an inhibitory or toxic effect on spermatogenesis in the rat. (2,4-TDA, CAS No. 95-80-7)<br>- Rat(male/female); screening for reproductive / developmental toxicity; oral; 0, 10, 50 and 250 mg/kg bw/day; NOAEL (P0, Reproductive Performance and Fertility) = 50 mg/kg bw/day, NOAEL (F1, Developmental Toxicity) = 50 mg/kg bw/day (No treatment-related effects were seen.) (OECD TG 421, GLP) |

| | |
|---|---|
| | - Rats(female); oral; 0, 10, 30, 100, 300 mg/kg bw/day; NOAEL (fetotoxicity) >= 100 mg/kg bw/day (OECD TG 414)<br>- Rabbits(female); oral; 3, 10, 30, 100 mg/kg bw/day; NOAEL (fetotoxicity) = 30 mg/kg bw/day (OECD TG 414) |
| (i) Specific target organ toxicity (single exposure) | Not classified |
| | Rat; inhalation: vapor; No adverse effects seen during exposure, for 14 days observation or on postmortem examination. 4h-$LCL_0$ > 670 ppm, no deaths. |
| (j) Specific target organ toxicity (repeat exposure) | Not classified |
| | The oral administration of ortho-TDA by gavage over a period of 28 days revealed substance-related adverse findings in animals of both sexes at 250 mg/kg bw/day. There were general clinical signs of toxicity at this dose and reduced body weight gain. Changes in some in clinical pathology indices indicates the liver as target organ. The no observed adverse effect level (NOAEL) under the conditions of the present study was 50 mg/kg body weight/day in male and female rats. (OECD TG 407, GLP) |
| (k) Aspiration Hazard | Not applicable |

## 12. Ecological information

| | |
|---|---|
| 12.1 Toxicity | |
| Acute toxicity | Category 1 |
| | Fish: 96h-$LC_{50}$ (*Danio rerio*) = 20 mg/L, static, freshwater (3,4-TDA, CAS No. 496-72-0) (OECD TG 203)<br>Invertebrate: 48h-$EC_{50}$ (*Daphnia magna*) = 2.47 mg/L, static, freshwater (OECD TG 202, GLP)<br>Algae: 72h-$ErC_{50}$ (*Desmodesmus subspicatus*) = 0.38 mg/L, freshwater (OECD TG 201, GLP) |
| Chronic toxicity | Category 1 |
| | Fish: 10d-NOEC (*Danio rerio*) = 3.16 (Behaviour) ~ 10 (Hatching success) mg/L (m-TDA, CAS No. 25376-45-8) (OECD TG 212, GLP)<br>Invertebrate: 21d-NOEC (*Daphnia magna*) = 0.02 mg/L (length), semi-static, freshwater (OECD TG 211, GLP)<br>Algae: 72h-$EbC_{10}$ (*Desmodesmus subspicatus*) < 0.01 mg/L, freshwater (OECD TG 201, GLP) |
| 12.2 Persistence and degradability | Half-life by hydrolysis: ca. 60 hrs at pH 7, 50 °C (OECD TG 111, GLP)<br>Biodegradation:<br>- 4% degradation was observed after 28 days.; not readily biodegradable (2,4-TDA, CAS No. 95-80-7) (OECD TG 301B, GLP)<br>- 100% degradation (DOC removal) was observed after 28 days.; inherently biodegradable (2,3-TDA, CAS No. 2687-25-4) (OECD TG 302B) |
| 12.3 Bio-accumulative potential | log $K_{ow}$ = 0.66 (20 ℃)<br>Bioaccumulation: Not available |
| 12.4 Mobility in soil | $K_{oc}$ = 4,454 (2,4-TDA, CAS No. 95-80-7) |
| 12.5 Hazardous to the ozone layer | Not applicable |
| 12.6 Other adverse effects | Not available |

## 13. Disposal considerations

**13.1 Disposal method**
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

**13.2 Disposal precaution**
Consider the required attentions in accordance with waste treatment management regulation.

## 14. Transport information

**14.1 UN No.:** 3077

**14.2 UN Proper shipping name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S., MOLTEN(3(or 4)-Methylbenzene-1,2-diamine)

**14.3 Transport Hazard class**
ADR: 9
IMDG: 9
ICAO/IATA: 9
RID: 9

**14.4 Packing group:** III

**14.5 Environmental hazards:** Applicable

**14.6 Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code):** Regulated

**14.7 Special precautions for user**
**in case of fire:** F-A
**in case of leakage:** S-F

## 15. Regulatory information

**15.1 Safety, health, and environmental regulation/legislation specific for the substance or mixture USA**

**U.S.A Regulatory Information**
**TSCA (Toxic Substances Control Act)**: Not regulated
**Proposition 65**: Not Regulated
**OSHA Regulation:** Not regulated
**CERCLA Regulation:** Not regulated
**SARA 311/312 Hazard classes**: Not regulated
**SARA 302 Regulation:** Not Regulated
**SARA 304 Regulation:** Not regulated
**SARA 313 Regulation:** Not Regulated

**International Agreements Information**
**Substance of Rotterdam Protocol:** Not regulated
**Substance of Stockholm Protocol:** Not regulated
**Substance of Montreal Protocol:** Not regulated

**Foreign Inventory Status**
- Korea management information: Toxic Chemical (97-1-299), Phase-in substance subject to registration (441)
- European Inventory of Existing Commercial chemical Substances (EINECS): Present (248-145-0)
- Japan management information: Existing and New Chemical Substances (ENCS): (3)-126
- Australia management information: Australia Inventory of Industrial Chemicals (AIIC): present

- Philippines management information: Philippines Inventory of Chemicals and Chemical Substances (PICCS): present
- Taiwan management information: Taiwan Chemical Substance Inventory (TCSI): present

## 16. OTHER INFORMATION

### 16.1 Indication of changes:

Preparation date: September 9, 2002
Version: 13
Revision date: January 17, 2024

### 16.2 Key literature reference and sources for data:

- TSCA; http://iaspub.epa.gov/sor_internet/registry/substreg/searchandretrieve/searchbylist/search.do
- EU Regulation 1272/2008
- TOMES-LOLI®; http://www.rightanswerknowledge.com/loginRA.asp
- UN Recommendations on the transport of dangerous goods 17th
- IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; http://monographs.iarc.fr
- ECHA CHEM; http://echa.europa.eu/web/guest/information-on-chemicals/registered-substances
- OECD SIDS; http://webnet.oecd.org/
- Pubchem; http://pubchem.ncbi.nlm.nih.gov/
- EPA; http://www.epa.gov/iris
- EPISUITE Program ver.4.1
- NIOSH(The National Institute for Occupational Safety and Health)
- ACGIH(American Conference of Governmental Industrial Hygienists)
- National chemicals information systems; http://ncis.nier.go.kr
- National Institute of Environmental Research Notification No. 2023-56 (Hazard Review Results of Chemical Substances)

### 16.3 Abbreviations

ACGIH: American Conference of Governmental Industrial hygienists
NIOSH: The National Institute for Occupational Safety and Health
OSHA: Occupational Safety & Health Administration
IARC: International Agency for Research on Cancer
ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road
IMDG: International Maritime Dangerous Goods
ICAO/IATA: International Civil Aviation Organization/ International Air Transport Association
RID: Regulations Concerning the International Transport of Dangerous Goods by Rail

### 16.4 Other

- Product should be handled, stored, and used in accordance with the generally accepted industrial hygiene practices and in conformity with all the applicable legal regulations.
- The information provided herein is based on the knowledge possessed at this present time from the viewpoint of safety requirements.
- It should, therefore, not be construed as guaranteeing specific properties.