Hanwha Chemical

SAFETY DATA SHEET

Date Printed: November 30, 2016
Version: 14
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 T-80
1.1.2 Other means of identification: Toluene diisocyanate
1.2 Recommended use of the chemical and restrictions on use
1.2.1 Recommended use: Soft foam is being used in footwear, furniture, automotive, bedding, toys and semi-rigid foams used car interiors, etc.
1.2.2. Restrictions on use: Do not use for purposes other than those recommended.

1.3 Details of the supplier of the safety data sheet
1.3.1 Manufacturer
Company name: TDI Plant, Hanwha Chemical Co, Ltd.
Address: 46-47, Yeosusandan 2-ro, Yeosu-si, Jeollanam-do, Korea
Prepared by: TDI Production Team
Contact Telephone: +82-61-688-4800
1.3.2 Supplier & Distributor
Company name: Hanwha Chemical Co, Ltd.
Address: 18F Hanwha Bldg., 86, Cheonggyecheon-ro, Jung-gu, Seoul, Korea
Prepared by: TDI Sales Team
Contact Telephone: +82-2-729-2700

1.4 Emergency phone number
Emergency phone : 1-800-424-9300, +1 703-527-3887, +1 713-402-1990 (Any problems that occures 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 (inhalation: vapors): Category 1
Skin corrosion/irritation: Category 2
Eye Damage/irritation: Category 2A
Skin sensitization: Category 1
Respiratory sensitization: Category 1
Carcinogenicity: Category 2
Specific target organ toxicity (Single exposure): Category 3 (respiratory tract irritation)

Environmental Hazards: Not classified

2.2 Label elements, including precautionary statements
- **Pictogram and symbol**:

- **Signal word**: Danger

o **Hazard statements**:
H315 Causes skin irritation.
H317 May cause an allergic skin reaction.
H319 Causes serious eye irritation
H330 Fatal if inhaled.
H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H335 May cause respiratory irritation.
H351 Suspected of causing cancer.

o **Precautionary statements:**

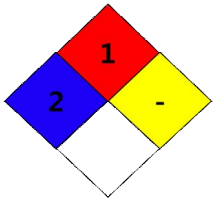
- Prevention:
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P260Do not breathe dust/fume/gas/mist/vapors/spray.
P261 Avoid breathing dust/fume/gas/mist/vapors/spray.
P264 Wash your hands thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P272 Contaminated work clothing should not be allowed out of the workplace.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P281 Use personal protective equipment as required.
P284 Wear respiratory protection.
P285 In case of inadequate ventilation wear respiratory protection.

- Treatment:
P302+P352 If on skin: Wash with plenty of soap and water.
P304+P340 If inhaled: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P304+P341 If inhaled: If breathing is difficult, remove victim to fresh air and keep at rest in a position 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 you feel unwell.
P320 Specific treatment is urgent (see Section 8 on this label).
P321 Specific treatment (see Section 8 on this label).
P332+P313 If skin irritation occurs: Get medical advice/ attention.
P333+P313 If skin irritation or rash occurs: Get medical advice/attention.
P337+P313 If eye irritation persists: Get medical advice/attention.
P342+P311 If experiencing respiratory symptoms: Call a poison center or doctor/physician.
P362 Take off contaminated clothing and wash before reuse.
P363 Wash contaminated clothing before reuse.

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

- Disposal:
P510: 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: -**
o **Specific hazard: -**

3. Composition/information on ingredients

Component	Common name and synonyms	CAS No.	Conc. / %
Toluene diisocyanate	Methyl-m-phenylene isocyanate	100	100
2,4-TDI		584-84-9	80
2,6-TDI		91-08-7	20

4. First aid measures

4.1 Description of first aid measures

Eye contact

- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If eye irritation persists: Get medical advice/attention.

Skin contact

- If skin irritation or rash occurs: Get medical advice/attention.
- Take off contaminated clothing and wash 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 inhaled: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing.
- Immediately call a poison center or doctor/physician.
- If exposed to excessive levels of dusts or fumes, remove to fresh air and get medical attention if cough or other symptoms develop.

Ingestion

- If exposed or concerned: Get medical advice/ attention.
- 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

- Inhalation: May cause acute toxic effects.
- Skin contact: Contact with this substance will cause skin irritation moderately.
- Eye contact: May cause severe irritation of eyes.

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:** Dry chemical, CO_2, Alcohol-resistant foam
- **Unsuitable extinguishing media**: Water

5.2 Specific hazards arising from the chemical

- Thermal decomposition products: NO_2, TDI vapors, CO_2, CO, HCl, HCN
- Vapor-air mixtures are explosive above flash point.
- Slight fire hazard when exposed to heat or flame.

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.
- 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.

6.2 Environmental precautions

- Prevent entry into waterways, sewers, basements or confined areas.

6.3 Methods and materials for containment and cleaning up

- Absorb spills with inert material (e.g., dry sand or earth), then place in a chemical waste container.
- Reduce dust and prevent scattering by moistening with water.
- Absorb the liquid and scrub the area with detergent and water.

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.
- Use only outdoors or in a well-ventilated area.
- Contaminated work clothing should not be allowed out of the workplace.
- Follow all MSDS/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.

7.2 Conditions for safe storage, including any incompatibilities

- Store in a well-ventilated place. Keep container tightly closed.
- Empty drums should be completely drained, properly bunged, and promptly returned to a drum reconditioner, or properly disposed of.
- Storage temperature : 20 ~ 30℃

8. Exposure controls/personal protection

8.1 Occupational Exposure limits

- **ACGIH**: TWA=0.005 ppm, STEL=0.02ppm
- **Biological exposure index**: 5 ㎍/g
- **OSHA**: Not available
- **NIOSH**: Not available
- **EU regulation**:
  - Belgium: TWA=0.005ppm(0.037mg/m^3), STEL=0.02ppm(0.14mg/m^3)
  - France: TWA=0.01ppm(0.08mg/m^3), STEL=0.02ppm(0.16mg/m^3)
  - Italy: TWA=0.005ppm, STEL=0.02ppm
- **Other**:
  - Colombia: TWA=0.02ppm, STEL=0.005ppm
  - Dominican Republic: TWA=0.005ppm, STEL=0.02ppm
  - Bahrain: TWA=0.01ppm(0.08mg/m^3)

8.2 Exposure controls

Appropriate engineering controls

- Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.
- If user operations generate dust, fume, or mist, use ventilation to keep exposure to airborne contaminants below the recommended exposure limit.
- Facilities for storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

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.

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 work place.

Hand protection

- Use Insulated gloves.
- 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:	Liquid
Color:	colorless to yellowish
Odor:	characteristic, pungent
Odor threshold:	0.05ppm

pH:	Not available
Melting point/freezing point:	11.5-13.5°C
Initial boiling point and boiling range:	251°C(1013hPa)
Flash point:	135°C
Evaporation rate:	Not available
Flammability (solid, gas):	No gas generation or spontaneous ignitions were observed during any of the tests.
Upper/lower flammability or explosive limits:	UEL 9.5% / LEL 0.5%
Vapor pressure:	0.03mmHg (25°C)
Vapor density:	6 (Air=1)
Relative density	1.22 (25°C)
Solubility:	Non-soluble
Solubility in organic solvents:	Not available
Partition coefficient: n-octanol/water:	LogKow=3.74 (estimated)
Auto ignition temperature:	>600°C
Decomposition temperature:	Not available
Viscosity:	3.1cPs (25 °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

- Stable(Non-hazardous polymerization occurs slowly above 40 ℃)
- Reacts exothermically with water yielding carbon dioxide and an organic base.
- May brown on exposure to sunlight
- Toxic gas that may accumulate in a closed space
- This material is frozen at less than 15°C, and can be produce dimer at high temperatures.

10.2 Conditions to avoid:

- Containers may be exploded and ruptured when heated.
- Keep away from heat/sparks/open flames/hot surfaces. No smoking.

10.3 Incompatible materials:

- Water, acid, acyl chloride, alcohol, aluminum, amines, ammonia, aniline, strong bases, copper and copper alloys, activated hydrogen, metal, oxidizing agents, plastics, rubber coating, polyurethane, surface active agents, zinc alloy

10.4 Hazardous decomposition products:

- Thermal decomposition products may include highly toxic hydrogen cyanide, and toxic and hazardous carbon oxides and nitrogen.

11. Toxicological information

Information on toxicological effects	
(a) Acute toxicity	
Oral	Not classified
	Rat(female) LD_{50}=4,130 mg/kg bw (OECD TG 401)
Dermal	Not classified
	Rabbit, LD_{50}>9,400 mg/kg bw (OECD TG 402)
Inhalation	Category 1

	Rat, LC_{50} (4h) = 0.234 mg/L (OECD TG 403)
(b) Skin Corrosion/ Irritation	Category 2
	In skin irritation test with rabbit for 72h, moderately irritating was shown (PDII: 4.7)
(c) Serious Eye Damage/ Irritation	Category 2A
	In an eye irritation study with rabbits, All three groups showed severe irritation of the conjunctivae, which continue for 18 days in the unwashed and two-second-wash groups, and for 20 days post-application in the group receiving the four-second-wash. (cornea score=0.66/4, iris score=0.33/2, conjunctivae score=3/3, chemosis score=4/4)
(d) Respiratory sensitization	Category 1
	In respiratory sensitization study with guinea pigs(female), results show that detection of antibodies and elicitation of pulmonary hypersensitivity response is dependent upon physicochemical properties of *hapten-protein* conjugate.
(e) Skin Sensitization	Category 1
	In skin sensitization: Local Lymph Node Assay with mice, the substance induces skin sensitization. (OECD TG 429)
(f) Carcinogenicity	Category 2
	- EU CLP 1272/2008: 2 (Suspected of causing cancer) - ACGIH: A4 (Not Classifiable as a Human Carcinogen) - IARC Group: 2B (Possibly Carcinogenic to Humans) - NTP: R (Reasonably Anticipated To Be A Human Carcinogen)
(g) Mutagenicity	Not classified
	In vitro: Bacterial Reverse Mutation Assay: with/ without metabolic activation: Positive (OECD TG 471) *In vivo*: Mammalian Erythrocyte Micronucleus Test: with/ without metabolic activation: Negative (OECD TG 474, GLP)
(h) Reproductive toxicity	Not classified
	Clinical signs of toxicity (nasal discharge in males and red-tinged fur in females) were observed in the high-exposure F0 group. And histopathology revealed a significant increase in the incidence of rhinitis in the nasal turbinate of F0 animals (both sexes). Hyperplasia and dysplasia of the respiratory epithelium of F0 males and hyperplasia was significantly increased in F0 females. In the high-exposure group (males), there was a significant increase in the incidence of submucosal lymphoid infiltrates in both the larynx and the trachea as well as a significant increase in the incidence of intracellular eosinophilic droplets. (NOAEC(P)=0.08 ppm, NOAEC(F1)=0.3 ppm, NOAEC(F2)=0.02 ppm) (OECD TG 416, GLP)
(i) Specific target organ toxicity (single exposure)	Category 3 (respiratory tract irritation)
	In an experiment, male Sprague-Dawley rats (n=4) were exposed head-only for 3 h to a 2,4- and 2,6-TDI mixture (80:20). Transient decreases in weight gain occurred post-exposure at the two highest concentrations, and rales were heard in one animal exposed at 1.45 ppm. (RD50(decrease of respiratory rate)=2.12 ppm) (Shiotsuka 1987b)
(j) Specific target organ toxicity (repeat exposure)	Not classified
	In a combined chronic toxicity and carcinogenicity study with mice, increased clinical signs of swollen abdomens and opaque watery eyes were observed from week 65 onwards. And histopathology revealed marked inflammatory processes in trachea, larynx, bronchi, lungs and predominantly in nasal turbinate (chronic and necrotic rhinitis) of male and female animals. (NOAEC(male)=0.05 ppm, NOAEC(female)<0.05 ppm, LOAEC(male)=0.15 ppm, LOAEC(male)=0.05 ppm)

	(OECD TG 453, GLP) This substance has already been classified for specific health hazard categories (acute inhalation, skin/respiratory sensitization, skin/eye/respiratory irritation, etc.) due to membrane irritation, sensitization, etc., and therefore should not be classified for specific target organ toxicity.
(k) Aspiration Hazard	Not available

12. Ecological information

12.1 Toxicity	
Acute toxicity	Not classified
	Fish: *Oncorhynchus mykiss*, LC_{50}(96h)=133 mg/L static (OECD TG 203) Invertebrate: *Daphnia magna*, EC_{50}(48h)=12.5 mg/L static (OECD TG 202) Algae: *Skeletonema costatum*, EC_{50}(96h)=3,230 mg/L static (OECD TG 201)
Chronic toxicity	Not classified
	Invertebrate: *Daphnia magna*, NOEC(21d)=1.1 mg/L static (OECD TG 211, GLP)
12.2 Persistence and degradability	Persistence: Low persistency (log Kow is more than 4 estimated.) (LogKow=3.43 (22 °C, pH ca.7)) Degradability: Half lifecycle: 0.5 min (calculated)
12.3 Bio-accumulative potential	Bioaccumulation: Bioaccumulation is expected to be low according to the BCF <500 (BCF = 136.4L/kg wet-wt(estimated)) Biodegradation: As not well-biodegraded, it is expected to have high accumulation potential in living organisms (0% biodegradation was observed after 28 days) (OECD TG 302C)
12.4 Mobility in soil	High potency of mobility to soil. (Koc =1,760(estimated))
12.5 Hazardous to the ozone layer	Not classified
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.: 2078

14.2 UN Proper shipping name: TOLUENE DIISOCYANATE

14.3 Transport Hazard class

ADR: 6.1
IMDG: 6.1
ICAO/IATA: 6.1
RID: 6.1

14.4 Packing group: II

14.5 Environmental hazards: Not 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-A

15. Regulatory information

15.1 Safety, health and environmental regulation/legislation specific for the substance or mixture USA Regulatory Information
TSCA (Toxic Substances Control Act): Section 8(b) inventory (Present)
Proposition 65: Not regulated
OSHA Regulation: Not regulated
CERCLA Regulation: 100lb, 45.4kg
SARA 311/312 Hazard classes: Regulated
SARA 302 Regulation: Not regulated
SARA 304 Regulation: Not regulated
SARA 313 Regulation: Regulated

Foreign Regulatory 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: Existing Chemical Substance (KE-10914), Accident precaution chemicals Phase-in substance subject to registration (437), Toxic Chemical (2010-1-611)
- European Inventory of Existing Commercial Chemical Substances(EINECS): Present (247-722-4)
- China management information: Inventory of Existing Chemical Substances (IECSC): Present (11919)
- Japan management information: Existing and New Chemical Substances (ENCS): (3)-2214
- Canada management information: Domestic Substances List (DSL): Present
- Australia management information: Australia Inventory of Chemical Substances (AICS): Present
- New Zealand management information: New Zealand Inventory of Chemicals (NZIoC): HSNO Approval: HSR003307
- Philippines management information: Philippines Inventory of Chemicals and Chemical Substances (PICCS): Present

16. OTHER INFORMATION

16.1 Indication of changes:
Preparation date: August 12, 2016
Version: 13
Revision date: December 14, 2001

16.2 Key literature reference and sources for data:
○ National chemicals information systems; http://ncis.nier.go.kr
○ Pubchem; http://pubchem.ncbi.nlm.nih.gov/
○ AKRON; http://ull.chemistry.uakron.edu/erd/
○ IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; http://monographs.iarc.fr
○ ECHA; http://echa.europa.eu/web/guest
○ NIOSH(The National Institute for Occupational Safety and Health)
○ ACGIH(American Conference of Governmental Industrial Hygienists)
○ TOMES-LOLI®; http://www.rightanswerknowledge.com/loginRA.asp
○ National Emergency Management Agency-Korea dangerous material inventory management system; http://hazmat.mpss.kfi.or.kr/index.do
○ Waste Control Act enforcement regulation attached [1]

○ EPISUITE Program ver.4.1

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 view point of safety requirements.
- It should, therefore, not be construed as guaranteeing specific properties.