Safety Data Sheet

1. Product and company identification
   a) Product Name
   YD-128K
   b) Recommended use of the chemical and restrictions on use
   General Use: Paints, coatings, adhesives, composite and electronic devices.
   Limit use: No data
   c) Manufacturer/Supplier/Distributor Information
   Manufacturer: KUKDO Chemical Co., Ltd.
   Address: 61, Gasandigital 2-ro, Gumcheon gu, Seoul, Korea
   Emergency or Information Contact:
   Tel: +82-2-3282-1560
   Fax: +82-2-3282-1586
   Responsible department: R&D Center

2. Hazards identification
   a) Hazard-Risk Classification
   Acute Toxicity - Oral: Category 4
   Skin Corrosion/Irritation: Category 2
   Serious Eye Damage/Irritation: Category 2A
   Skin Sensitization: Category 1
   Chronic hazards to the aquatic environment: Category 2
   b) Label elements including precautionary statements
   Signal Word: Warning
   Hazard-Risk Statement:
   H302 Harmful if swallowed
   H315 Causes skin irritation
   H319 Cause serious eye irritation
   H317 May cause allergic skin reaction
   H411 Toxic to aquatic life with long lasting effects
   Precautionary Statement
   Prevention:
   P264 Wash ... thoroughly after handling.
   P270 Do not eat, drink or smoke when using this product
   P280 Wear protective gloves/protective clothing/eye protection/face protection.
   P261 Avoid breathing dust/fume/gas/mist/vapors/spray.
   P272 Contaminated work clothing should not be allowed out of the workplace.
   P273 Avoid release to the environment.
   Response:
   P301+P312 IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
   P330 Rinse mouth.
P302+P352 IF ON SKIN: Wash with plenty of soap and water.
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313 If eye irritation persists: Get medical advice/attention.
P333+P313 If skin irritation or rash occurs: Get medical advice/attention.
P363 Wash contaminated clothing before reuse.
P391 Collect spillage.

Storage
No data

Disposal
P501 Dispose of contents/container to ...

c) Other Hazard-Risk which are not included in the classification criteria

| Health | 2 |
| Fire   | 1 |
| Reactivity | 0 |

3. Composition/Information on ingredients

| Chemical Name | 4,4′-Isopropylidenediphenol, oligomeric reaction products with 1-chloro-2,3-epoxypropane |
| Other name   | DIGLYCIDYL ETHER OF BISPHENOL A |
| CAS number   | 25068-38-6 |
| Content (%)  | 100% |

4. First aid measures

a) Eye contact
Flush eyes with plenty of water for at least 15 minutes while holding eyelids open.
Consult a physician if signs of irritation appear

b) Skin contact
Immediately remove contaminated clothing or shoes, wash skin with plenty of water for at least 15 minutes.
Use soap if readily available, or follow by thoroughly washing soap and water.
Do not reuse clothing until thoroughly decontaminated.
Move person to fresh air area and provide oxygen if breathing is difficult.
Consult a physician if effects occur.

Inhalation
No data for side effect.

Irritation

Skin contact
Short-term exposure
No data for side effect.

Prolonged exposure
Irritation, allergic reaction

Eye contact
Short-term exposure
Irritation

Prolonged exposure
Irritation

Ingestion
Short-term exposure
Irritation, allergic reaction

Prolonged exposure
Irritation, allergic reaction

D4. First aid measures

a) Eye contact
Flush eyes with plenty of water for at least 15 minutes while holding eyelids open.
Consult a physician if signs of irritation appear

b) Skin contact
Immediately remove contaminated clothing or shoes, wash skin with plenty of water for at least 15 minutes.
Use soap if readily available, or follow by thoroughly washing soap and water.
Do not reuse clothing until thoroughly decontaminated.
Move person to fresh air area and provide oxygen if breathing is difficult.
Consult a physician if effects occur.

d) Ingestion
Do not induce vomiting because of risk of aspiration.
Rinse mouth with water.
Consult a physician if effects occur.

e) Acute and delayed symptoms/effects

<table>
<thead>
<tr>
<th>Inhalation</th>
<th>Irritation, allergic reaction, blood congestion of th lungs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-term exposure</td>
<td>Irritation, allergic reaction</td>
</tr>
<tr>
<td>Long-term exposure</td>
<td></td>
</tr>
<tr>
<td>Ingestion</td>
<td>No data for side effect.</td>
</tr>
<tr>
<td>Short-term exposure</td>
<td>No data for side effect.</td>
</tr>
<tr>
<td>Prolonged exposure</td>
<td></td>
</tr>
<tr>
<td>Skin contact</td>
<td>Irritation, allergic reaction</td>
</tr>
<tr>
<td>Short-term exposure</td>
<td>Irritation, allergic reaction</td>
</tr>
<tr>
<td>Prolonged exposure</td>
<td></td>
</tr>
<tr>
<td>Eye contact</td>
<td>Irritation</td>
</tr>
<tr>
<td>Short-term exposure</td>
<td>Irritation</td>
</tr>
<tr>
<td>Prolonged exposure</td>
<td></td>
</tr>
</tbody>
</table>
5. Fire-Fighting measures

a) Suitable (and unsuitable) extinguishing media
   - Suitable extinguishing media: Dry chemical, carbon dioxide, water, foam in use.
   - Unsuitable extinguishing media: No data

b) Specific hazards arising from the chemical
   - Combustion product: In case of fire, toxic fumes might be formed
   - Fire-fighting hazard: May cause fire

6. Accidental release measures

a) Personal precautions, protective equipment and emergency procedures
   - Use protective equipment as required.
   - Avoid skin contact or inhalation.

b) Environmental precautions and protective procedures
   - Air: No data
   - Soil: No data
   - Underwater: Store away from water supply and drainage.

7. Handling and storage

a) Precautions for safe handling
   - Keep in a cool, well-ventilated place and container closed.

b) Conditions for safe storage
   - Avoid contact with skin and eyes. Use with adequate ventilation.
   - Keep away from heat, flame, sparks and high temperature.

8. Exposure controls & personal protection

a) Control parameters
   - Domestic regulation: No data
   - ACGIH (TLV): No data
   - OSHA (PEL): No data
   - NIOSH (REL): No data
   - NIOSH (IDLH): No data
   - ACGIH (BEI): No data

b) Appropriate engineering controls
   - Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.
   - Use adequate ventilation to keep airborne concentration low.

b) Personal protective equipment
   - Respiratory protection: Never exceed the national Occupational Exposure Limit.
   - Use local. Exhaust ventilation or handle in a ventilated enclosure.
   - For greater protection a face piece chemical cartridge respirator is recommended.
9. Physical and chemical properties

a) Appearance
   physical state: Liquid
   color: Pale yellow
b) Odor: Odorless
c) Odor threshold: No data
d) pH: 6-8
e) Melting point/freezing point: -16°C (at 1,013hPa)
f) Initial boiling point and boiling range: ≥ 204.4°C
g) Flashing point: 266°C (at 1,013hPa)
h) Evaporation rate: No data
i) Flammability (solid, gas): No data
j) Upper/lower flammability or explosive limits: No data
k) Vapor pressure: 4.6 x 10^{-8} Pa (at 25°C)
l) Solubility: 6.9mg/L (at 20°C) - Insoluble
m) Vapor density: No data
n) Relative density: 1.17 (Water = 1)
o) Partition coefficient: n-octanol/water
   Log P = 3.242 +/- 0.324 (at 25°C and pH 7.1)
   log Kow = 2.821
p) Auto-ignition temperature: No data
q) Decomposition temperature: No data
r) Viscosity: 11,500 - 13,500cps (25°C)
s) Formula mass (Mw): 350 - 400

10. Stability and reactivity

a) Chemical stability: Stable at normal temperature and pressure.
b) Possibility of hazardous reactions: No data
c) Conditions to avoid: Excessive heating.
   Avoid to contact with strong oxidizing agent, heat, spark and flame.
d) Incompatible materials: Acids, amines, bases, oxidizing agents.
e) Hazardous decomposition products: May produce hazardous carbon oxides, chloro hydrogen.

11. Toxicological information

a) Information on the likely routes of exposure
   by respiratory organ: May cause respiratory organ irritation.
   by mouth: No data
   by skin and contact: May cause skin irritation.
   by eye and contact: May cause eye irritation.

b) Delayed and immediate effects as well as chronic effects from short- and long-term exposure
Acute toxic

Oral
LD50 > 2,000mg/kg bw (female rat (Wistar), OECD Guideline 420)
LD50 1,000 - 5,000mg/Kg Rat
LD50 500 - 2,000mg/Kg Mouse

Dermal
LD50 > 2,000 mg/kg bw (male/female rat (Wistar), OECD Guideline 402)
LD50 > 1,200 - 20,000mg/Kg Rat
LD50 > 20,000mg/Kg Rabbit
LD50 1,270mg/kg Mouse

Inhalation
4h-LC0 = approx. 0.89x10^-5 ppm (male rat (Albino))

Skin corrosive/irritant
Test material was slightly irritating to the skin in the key studies. For the skin, mean erythema and edema scores were 0.8 and 0.5, respectively.

Serious eye damage/eye irritation
Test material was slightly irritating to the eye in the key studies. The mean eye score was 0.4.

Respiratory sensitization
No data

Skin sensitization
In a local lymph node assay, the concentration that would cause a 3-fold increase in proliferation (EC-3) was calculated to be 5.7% which is consistent with moderate dermal sensitization potential.

Carcinogenicity

Chronic toxicity/carcinogenicity studies (Oral, Rats, 2 years)
NOAEL : 15mg/kg/day (male) - Decreased body weight, an enlarged cecum
NOAEL : 100mg/kg/day (female)

Chronic toxicity/carcinogenicity studies (Dermal)
The systemic NOEL : 1mg/kg/day (female rats)
- Histopathologic changes (10, 100mg/kg/day)
The systemic NOEL : 100mg/kg/day (male mice)
The application site NOEL : 0.1mg/kg/day (male mice)
- Epidermal hyperplasia,
  chronic dermal inflammation, epidermal crusts
  (10, 100mg/kg/application)

IARC
No data

NTP
No data

OSHA
No data

WISHA
No data

ACGIH
No data

Germ Cell Mutagenicity
Not classified

Histidine reverse gene mutation, Ames assay

<table>
<thead>
<tr>
<th>Type</th>
<th>Salmonella typhimurium (TA98, TA100, TA1535, TA1537,TA1538)</th>
<th>Test Code</th>
<th>Result</th>
<th>Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAL+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IN VITRO CHROMOSOMAL ABERRATIONS

<table>
<thead>
<tr>
<th>Type</th>
<th>CHL cells</th>
<th>Metabolic Activation</th>
<th>Without</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose</td>
<td>0.01-0.04mg/mL (Solvent; DMSO)</td>
<td>Dose Regime</td>
<td>24hr continuos</td>
</tr>
<tr>
<td>Result</td>
<td>Positive (Structure change)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reproductive toxicity

Effects on fertility (Rat, two generations)
No indications of any adverse effects on reproduction.
NOEL : 50mg/kg/day (adult males)
540mg/kg/day (adult female)

NOEL for reproductive effects : 750mg/kg/day.
Developmental toxicity
There was no evidence of developmental toxicity at doses levels resulting in maternal toxicity in rats and rabbits following oral administration or rabbits following dermal administration.

Oral gavage study
Slight body weight effects (250mg/kg/day and higher)
Enlarged cecum (necropsy, male rats, 250mg/kg/day)
Slight histopathologic changes
(the adrenal gland, cecum and kidney, rats, 250mg/kg/day)
A 3% decrease in body weight (female rats, 50mg/kg/day)

Dermal study
The systemic toxicity NOAEL : 100mg/kg/day
- slight decrease in body weights (1000mg/kg/day)
Dermal effects NOEL : 10mg/kg/day (female rats)

Aspiration hazard
No data

c) Numerical measures of toxicity
intraperitoneal (i.p.) LD50 1,400 - 2,400mg/kg Rat
LD50 1,780 - 4,000mg/kg Mouse

12. Ecological information
a) Aquatic and terrestrial ecotoxicity
   fish
   96hr-LC50 = 3.6mg/L test mat. *Oncorhynchus mykiss*
   (direct application, nominal) (OECD Guideline 203)
   LC50 1.41mg/L 96hr *Oryzias latipes*
   crustacea
   48hr-EC50 = 2.8mg/L test mat. *Daphnia magna*
   (Direct addition, nominal, based on : mobility)
   (OECD Guideline 202)
   EC50 1.7mg/L 48hr
   aquatic plant
   72hr-EC50 > 11mg/L *Scenedesmus capricornutum*
   water soluble fraction (meas. (arithm. mean))
   based on: growth rate (EPA-660/3-75-009)

b) Persistence and degradability
   Persistence
   No data
   Resolvability
   No data

c) Bioaccumulative potential
   Concentration
   Kow = 3.24
   log Kow 2.281 (Estimated)
   BCF 31 L/kg ww
   BCF 0.56 - 0.67
   Bio resolvability
   0(%) 28day ; Non-degradable

   d) Mobility in soil
   Log Koc = 2.65 +/- 0.7
   ; QSAR prediction using the Kow method in KOCWIN v. 2.0 and
   Kow = 3.24 as input.

   e) Other adverse effects
   Invertebrates : 21d-NOEC = 0.3 mg/L test mat. *Daphnia magna*
   (nominal) based on: survival, growth and reproduction
   (OECD Guideline 211)
   Algae : 72hr-NOEC = 4.2 mg/L *Scenedesmus capricornutum*
   water soluble fraction (meas. (arithm. mean))
   based on: growth rate (EPA-660/3-75-009)

13. Disposal considerations
a) Disposal method
   Dispose of contents/container to the regulations

b) Disposal precaution
   No data

14. Transport information
a) UN number
   3082
b) UN proper shipping name  Environmentally hazardous substance, liquid, n.o.s.
c) Transport hazard class  9
d) Packing group  III
e) Marin pollution  P
f) Special precaution which a user to be aware of or needs to comply with in connection with transport or conveyance either within or outside their premises
   Emergency procedure at fire  F - A
   Emergency procedure at leakages  S - F

15. Regulatory information
   a) Occupational Safety and Health Act  Not applicable
   b) Toxic Chemical Control Act  Observational chemical
   c) Safety Control Dangerous Substance Act  Not applicable
   d) Wastes Control Act  Specific Waste
   e) Other requirements in domestic and other countries
      Domestic regulation
         Persistent Organic Pollutant Control Act  Not applicable
      Other countries
         USA (OSHA)  Not applicable
         USA (CERCLA)  Not applicable
         USA (EPCRA 302)  Not applicable
         USA (EPCRA 304)  Not applicable
         USA (EPCRA 313)  Not applicable
         USA (Rotterdam Convention material)  Not applicable
         USA (Stockholm Convention material)  Not applicable
         USA (Substance Montreal Protocol)  Not applicable
         EU (Classification)  Xi Irritation
         EU (Risk Phrases)  R36/38 Irritating to eyes and skin.
         EU (Risk Phrases)  R43 May cause sensitization by skin contact.
         EU (Risk Phrases)  R51/53 Toxic aquatic organisms, may cause long-term adverse effects in the aquatic environment.
         EU (Safety Phrases)  S2 Keep out of the reach of children.
         EU (Safety Phrases)  S28 After contact with skin, wash immediately with plenty of... (to be specified by the manufacturer).
         EU (Safety Phrases)  S37/39 Wear suitable protective clothing and eye/face protection.
         EU (Safety Phrases)  S61 Avoid release to the environment. Refer to special instructions/safety data sheets.

   Chemical Substance Inventory

<table>
<thead>
<tr>
<th>Country</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea (KECL)</td>
<td>KE-24000</td>
</tr>
<tr>
<td>USA (TSCA)</td>
<td>Listed</td>
</tr>
<tr>
<td>EU</td>
<td>S00-033-5</td>
</tr>
<tr>
<td>Japan (MITI/ENCS)</td>
<td>7-1279</td>
</tr>
<tr>
<td>China (IECSC)</td>
<td>Listed</td>
</tr>
<tr>
<td>Canada (DSL/NDSL)</td>
<td>DSL</td>
</tr>
<tr>
<td>Australia (AICS)</td>
<td>Listed</td>
</tr>
<tr>
<td>Korea (KECL)</td>
<td>KE-24000</td>
</tr>
<tr>
<td>USA (TSCA)</td>
<td>Listed</td>
</tr>
<tr>
<td>EU</td>
<td>S00-033-5</td>
</tr>
<tr>
<td>Japan (MITI/ENCS)</td>
<td>7-1279</td>
</tr>
<tr>
<td>China (IECSC)</td>
<td>Listed</td>
</tr>
<tr>
<td>Canada (DSL/NDSL)</td>
<td>DSL</td>
</tr>
<tr>
<td>Australia (AICS)</td>
<td>Listed</td>
</tr>
</tbody>
</table>

16. Other information
   a) Information source and references  No data
<table>
<thead>
<tr>
<th>b) Issuing date</th>
<th>2010-06-30</th>
</tr>
</thead>
<tbody>
<tr>
<td>c) Revision number and date</td>
<td>3</td>
</tr>
<tr>
<td>Revision No.</td>
<td>2012-04-10</td>
</tr>
<tr>
<td>Revision date</td>
<td>No data</td>
</tr>
</tbody>
</table>

Distributed by:

TRiiSO™

www.tri-iso.com

Request Quote or Samples