



MATERIAL SAFETY DATA SHEET

DAEHEUNG CHEMICAL CO., LTD. www.dhcbond.com

PGM

Product Name

DM-700H(A)

1. Product and Company Identification

- A. Product Name DM-700H(A)
- B. Recommended use of the chemical and restrictions on use
- Recommended use of the chemical Bonding resin for the PVC sheet and film to wood and plastic, hard board, wood based materials, resin felt, etc.
 - Restrictions on use of the product Do not use for purposes other than adhesive.
- C. Manufacturer/Supplier/Distributor Information
- Name DAEHEUNG CHEMICAL CO., LTD.
 - Address 68, Sandan-ro 64beon-gil, Pyeongtaek-si, Gyeonggi-do, Korea
 - Emergency phone number 82-31-668-1424

2. Hazards identification

- A. Hazard·Risk Classification
- Flammable liquids : category 2
 - Skin corrosion / Irritation : Category 2
 - Serious eye damage / Irritation : Category 2
 - Reproductive toxicity : Category 2
 - Target Organ Toxicity (Single Exposure) : Category 3(Respiratory tract irritation)
 - Target Organ Toxicity (Single Exposure) : Category 1
 - Target Organ Toxicity (Single Exposure) : Category 3(Narcotic effects)
 - Target Organ Toxicity (Repeated Exposure) : Category 1
 - Aspiration hazard : category 1

B. Label elements including precautionary statements

- Symbol



- Signal Word

Danger

- Hazard·Risk Statement

H225 Highly flammable liquid and vapour
H304 May be fatal if swallowed and enters airways
H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation
H336 May cause drowsiness or dizziness
H361 Suspected of damaging fertility or the unborn child
H370 Causes damage to organs
H372 Causes damage to organs through prolonged or repeated exposure

- Precautionary Statement

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/sparks/open flames/hot surfaces – No smoking
P233 Keep container tightly closed
P240 Ground/bond container and receiving equipment

Prevention	<p>P241 Use explosion–proof electrical/ventilating/light/equipment</p> <p>P242 Use only non–sparking tools</p> <p>P243 Take precautionary measures against static discharge</p> <p>P260 Do not breathe dust/fume/gas/mist/vapours/spray</p> <p>P261 Avoid breathing dust/fume/gas/mist/vapours/spray</p> <p>P264 Wash thoroughly after handling</p> <p>P270 Do not eat, drink or smoke when using this product</p> <p>P271 Use only outdoors or in a well–ventilated area</p> <p>P280 Wear protective gloves/protective clothing/eye protection/face protection</p> <p>P281 Use personal protective equipment as required</p>
Response	<p>P301+P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician</p> <p>P302+P352 IF ON SKIN: Wash with soap and water</p> <p>P303+P361+P353 IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower</p> <p>P304+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing</p> <p>P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing</p> <p>P307+P311 IF exposed: Call a POISON CENTER or doctor/physician</p> <p>P308+P313 IF exposed or concerned: Get medical advice/attention</p> <p>P312 Call a POISON CENTER or doctor/physician if you feel unwell</p> <p>P314 Get Medical advice/attention if you feel unwell</p> <p>P321 Specific treatment (see ... on this label)</p> <p>P331 Do NOT induce vomiting</p> <p>P332+P313 If skin irritation occurs: Get medical advice/attention</p> <p>P337+P313 If eye irritation persists get medical advice/attention</p> <p>P362 Take off contaminated clothing and wash before reuse</p> <p>P370+P378 In case of fire: Use dry chemical, CO₂, sand, earth, water spray or regular foam for extinction</p>
Storage	<p>P403+P233 Store in a well ventilated place. Keep container tightly closed</p> <p>P403+P235 Store in a well ventilated place. Keep cool</p> <p>P405 Store locked up</p>
Disposal	<p>P501 Dispose of contents/container to in accordance with local/regional/national/international regulation.</p>

C. Other Hazard-Risk which are not included in the classification criteria (e.g. dust explosion hazard)

TOLUENE	
Health	2
Fire	3
Reactivity	0
HEXANE	
Health	N/A
Fire	3
Reactivity	0
ACETONE	
Health	1
Fire	3
Reactivity	0

METHYL ETHYL KETONE	
Health	1
Fire	3
Reactivity	0
ADIPIC ACID-1,4-BUTANEDIOL-TDI COPOLYMER	
Health	N/A
Fire	N/A
Reactivity	N/A

3. Composition/Information on ingredients

Chemical Name	Other name	CAS number	Content(%)
TOLUENE	Toluol	108-88-3	20~30
HEXANE	Nomal-hexane N-hexane Hexane, n-Hexane Hexane (n-hexane) Hexane	110-54-3	1~5
ACETONE		67-64-1	40~50
METHYL ETHYL KETONE	Methylethylketone 2-butanone Methyl ethyl ketone(M.E.K) 2-Butanone	78-93-3	10~20
ADIPIC ACID-1,4-BUTANEDIOL-TDI COPOLYMER		Not Assigned	5~15

4. First aid measures

- A. 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
- B. Skin contact
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower

If skin irritation occurs: Get medical advice/attention
Remove and isolate contaminated clothing and shoes.

In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.

Shower and wash with soap and water.
- C. Inhalation
Do NOT induce vomiting

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Call a POISON CENTER or doctor/physician if you feel unwell
- D. Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician

Do NOT induce vomiting

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 other proper respiratory medical device.
- E. Indication of immediate medical attention and notes for physician
Call a POISON CENTER or doctor/physician.

Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. Fire-Fighting measures

A. Suitable (and unsuitable) extinguishing media	Dry chemical, CO ₂ , sand, earth, water spray or regular foam.
B. Specific hazards arising from the chemical (e.g. nature of any hazardous combustion products)	Highly flammable liquid and vapour Vapors may travel to source of ignition and flash back. Fire may produce irritating, corrosive and/or toxic gases. Those substances designated with a (P) may polymerize explosively when heated or involved in a fire. Containers may explode when heated. Flammable; may be ignited by heat, sparks or flames. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). When heated, vapors may form explosive mixtures with air: indoors, outdoors and sewers explosion hazards. Dust may form explosive mixtures with air
C. Special protective equipment and precautions for fire-fighters	Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection. Fight fire with normal precautions from a reasonable distance Vapors from liquefied gas are initially heavier than air and spread along ground. Move containers from fire area if you can do it without risk. Firefighters should be equipped with self-contained breathing apparatus to protect against potentially toxic and irritating fumes. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire.

6. Accidental release measures

A. Personal precautions, protective equipment and emergency procedures	Avoid breathing dust/fume/gas/mist/vapours/spray Isolate spill or leak area immediately for at least 500 meters (1/3 mile) in all directions. Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire. All equipment used when handling the product must be grounded. Stop leak if you can do it without risk. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Use clean non-sparking tools to collect material and place it into loosely covered plastic containers for later disposal.
B. Environmental precautions and protective procedures	Prevent entry into waterways, sewers, basements or confined areas.
C. Methods and materials for containment and cleaning up	Dike fire-control water for later disposal; do not scatter the material. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material. Dike far ahead of liquid spill for later disposal.

7. Handling and storage

A. Precautions for safe handling	Do not handle until all safety precautions have been read and understood. Use explosion-proof electrical/ventilating/light/equipment. Use only non-sparking tools.
----------------------------------	--

- A. Precautions for safe handling
- Avoid breathing dust/fume/gas/mist/vapours/spray.
 - Do not eat, drink or smoke when using this product.
 - Use only outdoors or in a well-ventilated area.
 - Keep away from heat/sparks/open flames/hot surfaces – No smoking
 - Follow all MSDS/label precautions even after container is emptied because it may retain product residues.
 - Use care in handling/storage.
 - Vent pressure slowly before opening.
 - Heating may cause a fire or explosion
- B. Conditions for safe storage (including any incompatibilities)
- Keep away from heat/sparks/open flames/hot surfaces – No smoking
 - Store in a well ventilated place. Keep cool
 - Store in a well ventilated place. Keep container tightly closed
 - Do not eat, drink or smoke when using this product

8. Exposure controls & personal protection

A. Control parameters (e.g. occupational exposure limit values, biological limit values)

– Occupational exposure limit values

TOLUENE	TWA – 50ppm 188mg/m ³ STEL – 150ppm 560mg/m ³
HEXANE	TWA – 50ppm 180mg/m ³
ACETONE	TWA – 500ppm 1188mg/m ³ STEL – 750ppm 1782mg/m ³
METHYL ETHYL KETONE	TWA – 200ppm 590mg/m ³ STEL – 300ppm 885mg/m ³
ADIPIC ACID–1,4–BUTANEDIOL –TDI COPOLYMER	No data available

– ACGIH limit values

TOLUENE	TWA 20 ppm
HEXANE	TWA 50 ppm
ACETONE	TWA 250 ppm STEL 500 ppm
METHYL ETHYL KETONE	TWA 200 ppm STEL 300 ppm
ADIPIC ACID–1,4–BUTANEDIOL –TDI COPOLYMER	No data available

– Biological limit values

TOLUENE	0.02mg/L(Blood), 0.03mg/L(Urine), 0.3mg/g(Creatine)
HEXANE	No data available
ACETONE	25 mg/L
METHYL ETHYL KETONE	2 mg/L
ADIPIC ACID–1,4–BUTANEDIOL –TDI COPOLYMER	No data available

B. Appropriate engineering controls

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Provide adequate ventilation.

C. Personal protective equipment

– Respiratory protection

The filter class must be suitable for the maximum contaminant concentration(gas/vapour/aerosol/particulates) that may arise when handling the product.

– Eye protection

Wear eye protection/face protection.

– Hands protection

Wear proper chemical resistant gloves.

– Body protection

Wear proper Protective clothing.

9. Physical and chemical properties

A. Appearance	
Physical state	Viscous liquid
Color	Clear
B. Odour	Solvent
C. Odour threshold	No data available
D. pH	Not Applicable
E. Melting point/freezing point	Not Applicable
F. Initial boiling point and boiling range	56 °C
G. Flashing point	-20 °C
H. Evaporation rate	No data available
I. Flammability(solid, gas)	No data available
J. Upper/lower flammability or explosive limits	2.5% / 13%
K. Vapor pressure	No data available
L. Solubility	Some solubility water
M. Vapor density	Above 2
N. Relative density	0.93
O Partition coefficient:n-octanol/water	Not Applicable
P. Auto-ignition temperature	465 °C
Q. Decomposition temperature	No data available
R. Viscosity	250~500cps (at 20 °C)
S. Formula mass	No data available

10. Stability and reactivity

A. Chemical stability and possibility of hazardous reactions	Highly flammable liquid and vapor Those substances designated with a (P) may polymerize explosively when heated or involved in a fire. Containers may explode when heated. HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames. Vapor explosion and poison hazard indoors, outdoors or in sewers. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Vapors may cause dizziness or suffocation. Fire may produce irritating, corrosive and/or toxic gases. Inhalation or contact with material may irritate or burn skin and eyes.
B. Conditions to avoid	Keep away from heat/sparks/open flames/hot surfaces – No smoking.
C. Incompatible materials	No data available
D. Hazardous decomposition products	Fire may produce irritating, corrosive and/or toxic gases. Fire may produce CO, CO ₂ , TDI, amine, nitrogen compounds.

11. Toxicological information

A. Information on the likely routes of exposure	
TOLUENE	No data available
HEXANE	No data available
ACETONE	No data available
METHYL ETHYL KETONE	No data available
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available

B. Health hazards information

- Acute toxic

Oral

TOLUENE	LD50 2600 mg/kg Rat
HEXANE	LD50 25000 mg/kg Rat
ACETONE	LD50 5280 mg/kg Rat (EHC(1990), SIDS(1997))
METHYL ETHYL KETONE	LD50 2737 mg/kg Rat
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available

Dermal

TOLUENE	LD50 120000 mg/kg Rat
HEXANE	No data available
ACETONE	LD50 12870 mg/kg Rabbit (EHC(1990), PATTY(1994), SIDS(1997))
METHYL ETHYL KETONE	LD50 6480 mg/kg Rabbit
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available

Inhalation

TOLUENE	LC50 12.5 mg/l 4 hr Rat
HEXANE	LC50 77000 ppm 1 hr
ACETONE	Vapor LC50 32000 ppm Rat
METHYL ETHYL KETONE	Vapor LC50 32 mg/l 4 hr Mouse
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available

- Skin corrosive/irritant

TOLUENE	Based on the evidence of moderate skin irritation caused by toluene in rabbit primary skin irritation test (4 hour exposure) (EU-RAR No. 30, 2003).
HEXANE	skin irritation was seen in humans evidence of exposure (MOE Risk Assessment The 1st volume (2002), EHC 122 (1993), DFGOT vol.14 (2000), PATTY (4th, 1994), ATSDR (1999)).
ACETONE	It was classified as out of Category from the statement of having no stimulativeness on rabbit skin (EHC 207 (1998)) and (SIDS (1999)).
METHYL ETHYL KETONE	There is description that when exposed to human skin, irritation was not observed (EHC 143 (1992), DFGOT vol.12 (1999), PATTY (4th, 1994), and ATSDR (1992)). But based on the description that mild to moderate irritation was observed in the skin application examination on rabbits (EHC 143 (1992), DFGOT vol.12 (1999), PATTY (4th, 1994), and ATSDR (1992)).
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available

- Serious eye damage/eye irritation

TOLUENE	Based on the description that the subjects recovered from the damage within 7 days in rabbit eye irritation test conducted in accordance with the OECD test guideline (EU-RAR No. 30, 2003), which suggests that toluene causes mild eye irritation.
HEXANE	Based on the description that the ocular irritant property was acknowledged in human exposure examples (MOE Risk Assessment 1st volume (2002)), and on the description that mild irritant property was acknowledged in the rabbits (DFGOT vol.14 (2000)).
ACETONE	Vapor stimulates public eye. However, if exposure stops, irritation will not follow (ATSDR (1994)). The result of severe is reported in the rabbit (ACGIH (2001)). Although a corneal epithelium is destroyed, substrate is not destroyed, and destruction of a corneal epithelium will be recovered in 4-6 days. Acetone is not corrosive eye irritations (SIDS (1999)).

METHYL ETHYL KETONE	There is description that irritation was seen in the eye in humans evidence of exposure to vapor (ACGIH and (7th, 2001), DFGOTvol.12 (1999), PATTY (4th, 1994), and IRIS (2003)). And the average value of the mark in 24 hours was corneal cloudings 2.5 and the conjunctival redness 2 in the eye irritation examination using a rabbit, but it had recovered mostly within seven days (ECETOC TR48 (1992)).
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available
- Respiratory sensitization	
TOLUENE	No data available
HEXANE	No data available
ACETONE	No data available
METHYL ETHYL KETONE	No data available
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available
- Skin sensitization	
TOLUENE	Based on the results of guinea pig maximization tests (EU-RAR No. 30, 2003) suggesting that toluene causes no skin irritation.
HEXANE	No data available
ACETONE	Since it was indicated negative by the Mouse ear swelling test and Guinea pig maximization test(SIDS (1999)).
METHYL ETHYL KETONE	No data available
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available
- Carcinogenicity	
Occupational Health and Safety Act	
TOLUENE	No data available
HEXANE	No data available
ACETONE	No data available
METHYL ETHYL KETONE	No data available
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available
Ministry of Employment and Labor Notice	
TOLUENE	No data available
HEXANE	No data available
ACETONE	No data available
METHYL ETHYL KETONE	No data available
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available
IARC	
TOLUENE	3
HEXANE	No data available
ACETONE	No data available
METHYL ETHYL KETONE	No data available
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available
OSHA	
TOLUENE	No data available
HEXANE	No data available
ACETONE	No data available
METHYL ETHYL KETONE	No data available
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available

ACGIH	
TOLUENE	No data available
HEXANE	No data available
ACETONE	A4
METHYL ETHYL KETONE	No data available
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available
NTP	
TOLUENE	No data available
HEXANE	No data available
ACETONE	No data available
METHYL ETHYL KETONE	No data available
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available
EU CLP	
TOLUENE	No data available
HEXANE	No data available
ACETONE	No data available
METHYL ETHYL KETONE	No data available
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available
- Germ Cell Mutagenicity	
TOLUENE	Based on negative data on heritable mutagenicity tests (dominant lethal tests), the absence of data on germ cell mutagenicity and genotoxicity tests in vivo and the positive data on somatic cell mutagenicity tests in vivo (micronucleus tests, chromosome aberration tests), described in EHC 52 (1986), EU-RAR No. 30 (2003), IARC 71(1999)and ATSDR (2000).
HEXANE	There is negative result by the dominant lethal test using rodents (EHC 122 (1993), DFGOT vol.4 (1992), ATSDR (1999)), and by the micronucleus test using mammalian erythrocyte(ATSDR (1999)), and by the chromosomal aberration test using mammals marrow cells (DFGOT vol.4 (1992))
ACETONE	We found the negative results for in vivo micronucleus examination (SIDS (1999), EHC 207 (1998)).
METHYL ETHYL KETONE	Since there were the negative results by the micronucleus tests which used mammalian erythrocytes (EHC 143 (1992), DFGOTvol.12 (1999), PATTY (4th, 1994), IRIS (2003), ATSDR (1992)).
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available
- Reproductive toxicity	
TOLUENE	Based on the results of human epidemiological studies suggesting increased incidence of natural abortion after toluene exposure, abnormal development and malformation of newborns caused by prenatal toluene abuse and decreased plasma concentrations of luteinizing hormone and testosterone after toluene exposure, described in IRIS Toxicological review (2005), EU-RAR No.30 (2003), IARC 71(1999), IARC 47 (1989), EHC 52 (1986) and ATSDR (2000), the following conclusion by Ng et al. (1992) in EU RAR30 (2003): "the study suggests an increased risk of late spontaneous abortions associated with exposure to toluene at levels around 88 ppm (range 50-150 ppm). The results of this study are used as a basis for the risk characterisation of developmental toxicity in humans,"and the evidence of increased incidences of foetal death and delayed ossification, a decrease and unossification of sternbrae, a shift in rib profile, excess ribs, retarded skeletal development, delayed reflex response, learning disability and early vaginal opening and testes descent at dosing levels not toxic to dams from rat and mouse teratogenicity tests. According to Da-Silva et al.(1991), toluene was accumulated in breast milk, although no developmental toxicity via lactation was observed.

HEXANE	The organization injury of the testis accompanied by inhibition of spermatogenesis is observed by inhalation exposure to a rat (EHC 122 (1993), DFGOT vol.4 (1992), IRIS (Access on July 2005) and ATSDR (1999)), and in 1000ppm exposure effect is observed in a testis, muscular atrophy (DFGOT vol.4 (1992)) and weight loss (ATSDR (1999)) were also shown.
ACETONE	There is a report that he has no effect on a miscarriage in an epidemiological study (ATSDR, 1994). It is reported of slight developmental toxicity (decrease of embryo weight) in rat high concentration exposure (11000 ppm (20 mg/L)) (EHC, 207 (1998)) and of the decrease of embryo weight and the increase of late embryo absortion rate in mouse high concentration exposure (6600 ppm (15.6 mg/L)) (EHC, 207 (1998)). There is a description that study is still more nearly required, for an animal with humans (EHC).
METHYL ETHYL KETONE	There are descriptions that fetal malformations were observed in teratogenicity studies of inhalation exposures in rats (EHC 143 (1992), DFGOTvol.12 (1999), PATTY (4th, 1994), IRIS (2003), and ATSDR (1992)). In a retest, however, malformations are not observed, although delayed ossification and mutations were observed (EHC 143 (1992), ACGIH (7th, 2001), DFGOTvol.12 (1999), PATTY (4th, 1994), IRIS (2003) and ATSDR (1992)). Furthermore, malformation is not observed, although lower weight levels of offsprings and mutations were also observed in teratogenicity studies of inhalation exposure to mice (EHC 143 (1992), ACGIH (7th, 2001), DFGOTvol.12 (1999), PATTY (4th, 1994), IRIS (2003) and ATSDR (1992)).
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available
- Specific target organ toxicity (single exposure)	
TOLUENE	Based on the human evidence including "toluene is rapidly absorbed mainly through inhalation and acts on the central nervous system. Toluene causes fatigue, sleepiness, dizziness and mild respiratory irritation at 50-100 ppm, excitement associated with paresthesia and nausea at 200-400 ppm and central nervous system suppression leading to drunkenness, delirium and abnormal gait at 500-800 ppm" (CERI Hazard Data 96-4, 1997) and "irritation to the eyes, nose and pharynx" (EU-RAR No. 30, 2003) and the evidence from animal studies including "anesthesia" (EU-RAR No. 30, 2003).
HEXANE	Although there is descriptions in EHC 122 (1993), ACGIH (7th, 2001), DFGOT vol.4 (1992), and PATTY (4th, 1994) referring to confirmation of giddiness, central nervous system depressant, etc. as acute inhalation toxicity in humans, it was judged that these effects were caused by anesthetic actions. Moreover, it was judged as Category 3 because of descriptions in ACGIH (7th, 2001) and PATTY (4th, 1994) referring to confirmation of respiratory irritant caused by inhalation exposure to humans, and of a description in PATTY (4th, 1994) referring to confirmation of anesthetic actions.
ACETONE	Based on the descriptions that irritation in the human throat is caused by 1200ppm exposure (ACGIH (2001)), that irritation is caused in the nasal cavity, throat and trachea by 1190 and 2400mg/m3/6h exposure to humans (EHC 207 (1998)), and that irritation was caused in the throat by 1000ppm/4h exposure (EHC 207 (1998)). So it was set as Category 3 (airway irritation). And the discriptions that a male who drank 200ml fell coma (recovering his conciousness in 12 hours), and that a worker exposed to 12000ppm experienced headache, dizziness, leg weakness and fainting (ACGIH (2001)). So it was also set as Category 3 (anesthetic actions) based on the descriptions that a male who drank 200 ml fell coma, recovering his conciousness in 12 hours, and that a worker exposed to 12000 ppm experienced headache, dizziness, leg weakness and dead faint(ACGIH (2001)).

METHYL ETHYL KETONE	There are descriptions that effects on the central nerve system were not observed in the inhalation exposure test by humans (EHC 143 (1992), DFGOTvol.12 (1999), IRIS (2003), and ATSDR (1992)), and that there was no statistically significant difference against contrast groups in the result of the time estimation test (EHC 143 (1992) and PATTY (4th, 1994)). On the other hand, since effects on the central nerve systems in the inhalation exposure test of the rat or the mouse were identified in comparatively low concentrations (EHC 143 (1992), PATTY (4th, 1994) and IRIS (2003)), the target organ was judged to be the central nerve system and it was set as Category 1. Moreover, based on the description that effects were observed in kidney by a moderate dosage of the oral administration to rats (DFGOTvol.12 (1999), IRIS (2003), and ATSDR (1992)), kidney was also judged to be the target organ and was set as Category 2. Furthermore, it was set as Category 3 based on the description that respiratory irritation was observed by the human evidence of inhalation exposure (ACGIH (7th, 2001), DFGOTvol.12 (1999), PATTY (4th, 1994), IRIS (2003), and ATSDR (1992)).
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available
- Specific target organ toxicity (repeated exposure)	
TOLUENE	Based on the human evidence including "Toluene induces drug dependency, and inhalant abuse of toluene causes chronic central nervous system damage including restricted vision, headache associated with nystagmus and hearing loss, tremor, ataxia and amnesia. Cerebral atrophy was found in CT tests, and renal dysfunction manifested as proteinuria and hematuria was also observed (CERI Hazard Data 96-4, 1997), "hearing loss, changes in brain-stem auditory evoked potential" (ATSDR, 2000) and "hepatic toxicity associated with an increase in SGOT, fatty degeneration of hepatic cells and lymphocytic infiltration (EU-RAR No. 30, 2003).
HEXANE	Based on the description that polyneuropathy (disorder of sensory nerve and motor nerves) is observed in human chronic exposure examples (MOE Risk Assessment The 1st volume (2002), EHC 122 (1993), ACGIH (7th, 2001), DFGOT vol.14 (2000), PATTY (4th, 1994), IRIS (2005), Japan Society for Occupational Health advice (1993), and ATSDR (1999)), target organs were judged to be central nervous systems and peripheral nervous systems.
ACETONE	It was classified into Category 2, since by the examination using volunteers, the significant increase in white corpuscles and an eosinophil and the significant reduction of a phagocytosis of a neutrophil were observed in the exposure group with 500 ppm, 6 hours/day for 6 days (ACGIH (2001)). In the examination using the rat and the mouse, although it was a dose greatly beyond guidance limits, the similar haematological changes like in humans was admitted (SIDS (1999)). Since in other examination using a rat and a mouse, each is over the guidance limits (ACGIH (2001)),(SIDS (1999)) and there is also no example of a report in humans, they were not adopted as a classification basis.
METHYL ETHYL KETONE	It was classified all to Category 1 considering target organ a central nervous systems and the peripheral nervous system, according to the description that the sensory paralysis of hand and arm was seen in the case of human occupation exposure(EHC 143 (1992), DFGOTvol.12 (1999) and IRIS (2003)), the description suggesting the central nervous systems disorders in the case of occupation exposure (DFGOTvol.12 (1999) and IRIS (2003)), and the description about three cases in which the effects on the central nervous systems were seen (IRIS (2003)).
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available
- Aspiration hazard	
TOLUENE	Since it is a hydrocarbon and the dynamic viscosity at 40 degrees C is 20.5mm ² /s or less
HEXANE	Since it is a hydrocarbon and the dynamic viscosity at 40 degrees C is 20.5mm ² /s or less
ACETONE	The calculated dynamic viscosity is 0.426mm ² /sec and there was not the animal data of chemical pneumonia, however, it was the ketone of under C13.
METHYL ETHYL KETONE	primary normal alcohol composed of carbon atoms (3<=n<=13) and containing an isobutyl alcohol and ketone composed of carbon atoms (n<=13).

ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER No data available

12. Ecological information

A. Aquatic and terrestrial ecotoxicity

- Fish

TOLUENE	LC50 24 mg/l 96 hr <i>Oncorhynchus mykiss</i>
HEXANE	No data available
ACETONE	LC50 > 100 mg/l 96 hr
METHYL ETHYL KETONE	LC50 3220 mg/l 96 hr <i>Pimephales promelas</i>
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available

- Shellfish

TOLUENE	EC50 11.5 mg/l 48 hr <i>Daphnia magna</i>
HEXANE	LC50 3.88 mg/l 4 hr
ACETONE	No data available
METHYL ETHYL KETONE	EC50 5091 mg/l 48 hr <i>Daphnia magna</i>
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available

- Birds

TOLUENE	No data available
HEXANE	No data available
ACETONE	No data available
METHYL ETHYL KETONE	EC50 > 500 mg/l 96 hr <i>Skeletonema costatum</i>
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available

B. Persistence and degradability

- Persistence

TOLUENE	log Kow 2.73
HEXANE	log Kow 3.9
ACETONE	log Kow -0.24
METHYL ETHYL KETONE	log Kow 0.29
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available

- Resolvability

TOLUENE	No data available
HEXANE	No data available
ACETONE	No data available
METHYL ETHYL KETONE	No data available
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available

C. Bioaccumulative potential

- Concentration

TOLUENE	No data available
HEXANE	No data available
ACETONE	No data available
METHYL ETHYL KETONE	No data available
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available

– Bio resolvability

TOLUENE	86 (%) 20 day
HEXANE	100 (%)
ACETONE	No data available
METHYL ETHYL KETONE	89 (%) 20 day
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available

D. Mobility in soil

TOLUENE	No data available
HEXANE	No data available
ACETONE	No data available
METHYL ETHYL KETONE	No data available
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available

E. Other adverse effects

TOLUENE	No data available
HEXANE	No data available
ACETONE	No data available
METHYL ETHYL KETONE	No data available
ADIPIC ACID-1,4-BUTANEDIOL -TDI COPOLYMER	No data available

13. Disposal considerations

A. Disposal method	Dispose according to the related regulations.
B. Disposal precaution	Follow details of related waste management act.

14. Transport information

A. UN number	1133
B. UN proper shipping name	ADHESIVES containing flammable liquid
C. Transport hazard class	3
D. Packing group (if applicable)	II
E. Marine pollution (yes/no)	Yes
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–E
– Emergency procedure at leakages	S–D

15. Regulatory information

A. Industrial Safety and Health Act	
Management harmful agents	Toluene, Hexane, Acetone, Methyl ethyl ketone
Working environment measurement target material (measurement period: 6 months)	Toluene, Hexane, Acetone, Methyl ethyl ketone
Special medical examination the substance (diagnostic period: 12 months)	Toluene, Hexane, Acetone, Methyl ethyl ketone
Exposure limits set material	Toluene, Hexane, Acetone, Methyl ethyl ketone
ADIPIC ACID-1,4-BUTANEDIOL-TDI COPOLYMER	No data available
B. Toxic Chemical Control Act	
Toxicant	Toluene, Methyl ethyl ketone
No data available	Hexane, Acetone, Adipic acid-1,4-butanediol-TDI copolymer
C. Dangerous Material Safety Control Act	
	The 4th type, the 1st petroleum type 2002
D. Wastes Management Act	
	Designated Wastes

E. Other requirements in domestic and other countries

- Domestic regulation

Persistent Organic Pollutant Control Act

TOLUENE	Not Applicable.
HEXANE	Not Applicable.
ACETONE	Not Applicable.
METHYL ETHYL KETONE	Not Applicable.
ADIPIC ACID-1,4-BUTANEDIOL-TDI COPOLYMER	Not Applicable.

- Other countries

USA(OSHA)

TOLUENE	Not Applicable.
HEXANE	Not Applicable.
ACETONE	Not Applicable.
METHYL ETHYL KETONE	Not Applicable.
ADIPIC ACID-1,4-BUTANEDIOL-TDI COPOLYMER	Not Applicable.

USA(CERCLA)

TOLUENE	453.599 kg 1000 lb
HEXANE	2267.995 kg 5000 lb
ACETONE	2267.995 kg 5000 lb
METHYL ETHYL KETONE	2267.995 kg 5000 lb
ADIPIC ACID-1,4-BUTANEDIOL-TDI COPOLYMER	Not Applicable.

USA(EPCRA 302)

TOLUENE	Not Applicable.
HEXANE	Not Applicable.
ACETONE	Not Applicable.
METHYL ETHYL KETONE	Not Applicable.
ADIPIC ACID-1,4-BUTANEDIOL-TDI COPOLYMER	Not Applicable.

USA(EPCRA 304)

TOLUENE	Not Applicable.
HEXANE	Not Applicable.
ACETONE	Not Applicable.
METHYL ETHYL KETONE	Not Applicable.
ADIPIC ACID-1,4-BUTANEDIOL-TDI COPOLYMER	Not Applicable.

USA(EPCRA 313)

TOLUENE	Applicable.
HEXANE	Applicable.
ACETONE	Not Applicable.
METHYL ETHYL KETONE	Not Applicable.
ADIPIC ACID-1,4-BUTANEDIOL-TDI COPOLYMER	Not Applicable.

USA (Rotterdam Convention material)

TOLUENE	Not Applicable.
HEXANE	Not Applicable.
ACETONE	Not Applicable.
METHYL ETHYL KETONE	Not Applicable.
ADIPIC ACID-1,4-BUTANEDIOL-TDI COPOLYMER	Not Applicable.

USA (Stockholm Convention material)

TOLUENE	Not Applicable.
HEXANE	Not Applicable.
ACETONE	Not Applicable.
METHYL ETHYL KETONE	Not Applicable.
ADIPIC ACID-1,4-BUTANEDIOL-TDI COPOLYMER	Not Applicable.

USA (Substance Montreal Protocol)

TOLUENE	Not Applicable.
HEXANE	Not Applicable.
ACETONE	Not Applicable.
METHYL ETHYL KETONE	Not Applicable.
ADIPIC ACID-1,4-BUTANEDIOL-TDI COPOLYMER	Not Applicable.

EU (Classification)

TOLUENE	F; R11 Repr. Cat. 3; R63 Xn; R48/20-65 Xi; R38 R67
HEXANE	F; R11 Repr. Cat. 3; R62 Xn; R48/20-65 Xi; R38 R67 N; R51-53
ACETONE	F; R11 Xi; R36 R66 R67
METHYL ETHYL KETONE	F; R11 Xi; R36 R66 R67
ADIPIC ACID-1,4-BUTANEDIOL-TDI COPOLYMER	Not Applicable.

EU (Risk Phrases)

TOLUENE	R11, R38, R48/20, R63, R65, R67
HEXANE	R11, R38, R48/20, R62, R65, R67, R51/53
ACETONE	R11, R36, R66, R67
METHYL ETHYL KETONE	R11, R36, R66, R67
ADIPIC ACID-1,4-BUTANEDIOL-TDI COPOLYMER	Not Applicable.

EU (Safety Phrases)

TOLUENE	S2, S36/37, S46, S62
HEXANE	S2, S9, S16, S29, S33, S36/37, S61, S62
ACETONE	S2, S9, S16, S26, S46
METHYL ETHYL KETONE	S2, S9, S16
ADIPIC ACID-1,4-BUTANEDIOL-TDI COPOLYMER	Not Applicable.

16. Other information

A. Information source and references

TOLUENE

- EU-RAR No.30 (2003)(Oral)
- ACGIH (7th; 2001)(Dermal)
- EU-RAR No.30 (2003)(Inhalation)
- HSDB (2005)(Persistence)

HEXANE

- NLM(Oral)
- EHC (1991), DFGOT (2000)(Inhalation)
- EHC (1991)(Shellfish)
- ICSC(Persistence)

ACETONE

- ICSC(Persistence)

METHYL ETHYL KETONE

RTECS(Oral)

RTECS(Dermal)

RTECS(Inhalation)

IUCLID(Skin corrosive or irritant)

ECOTOX(Fish)

ECOTOX(Shellfish)

ECOTOX(Birds)

ICSC(Persistence)

IUCLID(Bio resolvability)

ADIPIC ACID-1,4-BUTANEDIOL-TDI COPOLYMER

Source of data : Korea Occupational Safety and Health Agency (KOSHA)>

- | | |
|-----------------------------|-------------------|
| B. Issuing date | March 27, 2015 |
| C. Revision number and date | |
| Revision number | 2 |
| Date | February 15, 2016 |
| D. Others | |



MATERIAL SAFETY DATA SHEET

DEAHEUNG CHEMICAL CO., LTD. www.dhcbond.com

PGM


Product Name

DM-700H(B)

1. Product and Company Identification

- A. Product Name DM-700H(B)
- B. Recommended use of the chemical and restrictions on use
- Recommended use of the chemical Bonding hardner for the PVC sheet and film to wood and plastic, hard board, wood based materials, resin felt, etc.
 - Restrictions on use of the product Do not use for purposes other than adhesive.
- C. Manufacturer/Supplier/Distributor Information
- Name DAEHEUNG CHEMICAL CO., LTD.
 - Address 68, Sandan-ro 64beon-gil, Pyeongtaek-si, Gyeonggi-do, Korea
 - Emergency phone number 82-31-668-1424

2. Hazards identification

- A. Hazard·Risk Classification
- Acute toxicity(Oral) : Category 4
 - Acute toxicity(Inhalation:Vapor) : Category 1
 - Acute toxicity(Inhalation:mist) : Category 2
 - Skin corrosion / Irritation : Category 2
 - Serious eye damage / Irritation : Category 2
 - Respiratory sensitization : category 1
 - Skin Sensitization : Category 1
 - Carcinogenic : Category 2
 - Target Organ Toxicity (Single Exposure) : Category 1
 - Target Organ Toxicity (Single Exposure) : Category 3(Narcotic effects)
 - Target Organ Toxicity (Repeated Exposure) : Category 1
 - Chronic hazards to the aquatic environment : Category 2
- B. Label elements including precautionary statements
- Symbol 
 - Signal Word Danger
 - Hazard·Risk Statement
 - H302 Harmful if swallowed
 - 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
 - H336 May cause drowsiness or dizziness
 - H351 Suspected of causing cancer
 - H370 Causes damage to organs
 - H372 Causes damage to organs through prolonged or repeated exposure
 - H411 Toxic to aquatic life with long lasting effects

– Precautionary Statement

Prevention

- P201 Obtain special instructions before use
- P202 Do not handle until all safety precautions have been read and understood
- P260 Do not breathe dust/fume/gas/mist/vapours/spray
- P261 Avoid breathing dust/fume/gas/mist/vapours/spray
- P264 Wash ... thoroughly after handling
- P270 Do not eat, drink or smoke when using this product
- P271 Use only outdoors or in a well-ventilated area
- 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
- P281 Use personal protective equipment as required
- P284 Wear respiratory protection
- P285 In case of inadequate ventilation wear respiratory protection

Response

- P301+312 IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
- P302+352 IF ON SKIN : Wash with soap and water
- P304+340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
- P304+341: IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing
- P305+351+338 IF IN EYES : Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing
- P307+311: IF exposed: Call a POISON CENTER or doctor/physician
- 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
- P314 Get Medical advice/attention if you feel unwell
- P320 Specific treatment is urgent (see ... on this label)
- P321 Specific treatment (see ... on this label)
- P330 Rinse mouth
- P332+313 If skin irritation occurs: Get medical advice/attention
- P333+313 If skin irritation or a rash occurs: Get medical advice/attention
- P337+313 If eye irritation persists get medical advice/attention
- P342+311 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
- P391 Collect spillage

Storage

- P403+233: Store in a well ventilated place. Keep container tightly closed
- P405: Store locked up

Disposal

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

C. Other Hazard-Risk which are not included in the classification criteria (e.g. dust explosion hazard)

	ISOCYANIC ACID, POLYMETHYLENEPOLYLHENYLENE ESTER	METHYLENE DI(bis)PHENYLDIISOCYANATE	DICHLOROMETHANE
Health	N/A	N/A	2
Fire	N/A	N/A	1
Reactivity	N/A	N/A	0

3. Composition/Information on ingredients

Chemical name	Other name	CAS number	Content(%)
DICHLOROMETHANE	Methylene chloride	75-09-2	75~85
METHYLENE DI(bis)PHENYLDIISOCYANATE	Diphenylmethanediisocyanate 4,4'-Methylene di(bis)phenyl diisocyanate Diphenylmethane 4,4'-diisocyanate	101-68-8	5~10
ISOCYANIC ACID, POLYMETHYLENEPOLYLHENYLENE ESTER		9016-87-9	10~15

4. First aid measures

A. Eye contact	<p>IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing.</p> <p>If eye irritation persists get medical advice/attention</p>
B. Skin contact	<p>If skin irritation occurs: Get medical advice/attention.</p> <p>Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.</p> <p>In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.</p> <p>Remove and isolate contaminated clothing and shoes.</p> <p>In case of contact with substance, immediately flush skin or eyes with running water for at least 20minutes.</p>
C. Inhalation	<p>Remove victim to fresh air and keep at rest in a position comfortable for breathing.</p> <p>Call a POISON CENTER or doctor/physician if you feel unwell.</p>
D. Ingestion	<p>Wash mouth</p> <p>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 other proper respiratory medical device.</p>
E. Indication of immediate medical attention and notes for physician	<p>Call a POISON CENTER or doctor/physician.</p> <p>Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.</p>

5. Fire-Fighting measures

A. Suitable (and unsuitable) extinguishing media	Dry chemical, CO ₂ , sand, earth, water spray or regular foam.
B. hazards arising from the chemical (e.g. nature of any hazardous combustion products)	<p>Fire may produce irritating, corrosive and/or toxic gases.</p> <p>Containers may explode when heated.</p> <p>This material is not easily ignited, but will burn if heated.</p> <p>Non-flammable, Fire may produce irritating, corrosive and/or toxic gases.</p>
C. Special protective equipment and precautions for fire-fighters	<p>Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection.</p> <p>Fight fire with normal precautions from a reasonable distance</p> <p>Vapors from liquefied gas are initially heavier than air and spread along ground.</p> <p>Move containers from fire area if you can do it without risk.</p> <p>Firefighters should be equipped with self-contained breathing apparatus to protect against potentially toxic and irritating fumes.</p> <p>Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.</p> <p>ALWAYS stay away from tanks engulfed in fire.</p>

6. Accidental release measures

A. Personal precautions, protective equipment and emergency procedures	<p>Avoid breathing dust/fume/gas/mist/vapours/spray</p> <p>Isolate spill or leak area immediately for at least 500 meters (1/3 mile) in all directions.</p> <p>Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire.</p> <p>All equipment used when handling the product must be grounded.</p> <p>Stop leak if you can do it without risk.</p> <p>Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.</p> <p>Use clean non-sparking tools to collect material and place it into loosely covered plastic containers for later disposal.</p>
B. Environmental precautions and protective procedures	<p>Avoid release to the environment.</p> <p>Prevent entry into waterways, sewers, basements or confined areas.</p>
C. Methods and materials for containment and cleaning up	<p>Dike fire-control water for later disposal; do not scatter the material.</p> <p>Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.</p> <p>Use clean non-sparking tools to collect absorbed material.</p> <p>Dike far ahead of liquid spill for later disposal.</p>

7. Handling and storage

A. Precautions for safe handling	<p>Do not handle until all safety precautions have been read and understood.</p> <p>Use explosion-proof electrical/ventilating/light/equipment.</p> <p>Use only non-sparking tools.</p> <p>Avoid breathing dust/fume/gas/mist/vapours/spray.</p> <p>Do not eat, drink or smoke when using this product.</p> <p>Use only outdoors or in a well-ventilated area.</p> <p>Keep away from heat/sparks/open flames/hot surfaces – No smoking</p> <p>Follow all MSDS/label precautions even after container is emptied because it may retain product residues.</p> <p>Use care in handling/storage.</p> <p>Vent pressure slowly before opening.</p> <p>Heating may cause a fire or explosion</p>
B. Conditions for safe storage (including any incompatibilities)	<p>Keep away from heat/sparks/open flames/hot surfaces – No smoking</p> <p>Store in a well ventilated place. Keep cool</p> <p>Store in a well ventilated place. Keep container tightly closed</p> <p>Do not eat, drink or smoke when using this product</p>

8. Exposure controls & personal protection

A. Control parameters (e.g. occupational exposure limit values, biological limit values)

– Occupational exposure limit values

DICHLOROMETHANE	TWA – 50ppm 175mg/m ³
METHYLENE DI(bis)PHENYLDIISOCYANATE	TWA – 0.005ppm 0.055mg/m ³
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available

– ACGIH limit values

DICHLOROMETHANE	TWA 50 ppm
METHYLENE DI(bis)PHENYLDIISOCYANATE	TWA 0.005 ppm
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available

- Biological limit values

DICHLOROMETHANE	0.3mg/L
METHYLENE DI(bis)PHENYLDIISOCYANATE	No data available
ISOCYANIC ACID, POLYMETHYLENE POLYLHENELENE ESTER	No data available

B. Appropriate engineering controls Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Provide adequate ventilation.

C. Personal protective equipment

- Respiratory protection The filter class must be suitable for the maximum contaminant concentration(gas/vapour/aerosol/particulates) that may arise when handling the product.
- Eye protection Wear eye protection/face protection.
- Hands protection Wear proper chemical resistant gloves.
- Body protection Wear proper Protective clothing.

9. Physical and chemical properties

A. Appearance	
Physical state	Viscous liquid
Color	Yellowish clear
B. Odour	Solvent
C. Odour threshold	No data available
D. pH	Not Applicable
E. Melting point/freezing point	-95 °C
F. Initial boiling point and boiling range	40 °C
G. Flashing point	No data available
H. Evaporation rate	No data available
I. Flammability(solid, gas)	Can explode if exposed to slight heat.
J. Upper/lower flammability or explosive limits	25% / 12%
K. Vapor pressure	400mmHg (at 24 °C)
L. Solubility	Unsoluble in water
M. Vapor density	2.9
N. Relative density	1.31
O Partition coefficient:n-octanol/water	Not Applicable
P. Auto-ignition temperature	556 °C
Q. Decomposition temperature	No data available
R. Viscosity	Less than 100cps
S. Formula mass	No data available

10. Stability and reactivity

A. Chemical stability and possibility of hazardous reactions	This material is not easily ignited, but will burn if heated. Containers may explode when heated. Vapors may cause dizziness or asphyxiation without warning. Fire may produce irritating and/or toxic gases. Contact (skin, eyes) with vapors, dusts or substance may cause severe injury, burns.
B. Conditions to avoid	Heat/sparks/open flames/hot surfaces.
C. Incompatible materials	Keep away from flammable / combustible / reducing materials.
D. Hazardous decomposition products	Fire may produce irritating, corrosive and/or toxic gases. Corrosive and/or toxic fumes.

11. Toxicological information

A. Information on the likely routes of exposure

DICHLOROMETHANE	No data available
METHYLENE DI(bis)PHENYLDIISOCYANATE	No data available
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available

B. Health hazards information

- Acute toxic

Oral

DICHLOROMETHANE	LD50 1600 mg/kg Rat
METHYLENE DI(bis)PHENYLDIISOCYANATE	LD50 31600 mg/kg Rat
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	LD50 49000 mg/kg Rat

Dermal

DICHLOROMETHANE	No data available
METHYLENE DI(bis)PHENYLDIISOCYANATE	No data available
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	LD50 > 9500 mg/kg Rabbit

Inhalation

DICHLOROMETHANE	LC50 53 mg/l 6 hr
METHYLENE DI(bis)PHENYLDIISOCYANATE	LC50 0.369 mg/l 4 hr Rat
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	Vapor LC50 0.49 mg/kg 4 hr Rat

- Skin corrosive/irritant

DICHLOROMETHANE	"moderate irritation but no skin corrosion observed" from rabbit skin irritation tests (CERI-NITE Hazard Assessment No.15, 2004).
METHYLENE DI(bis)PHENYLDIISOCYANATE	Rabbit skin was irritated (IARC 19 (1979)).
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available

- Serious eye damage/eye irritation

DICHLOROMETHANE	"moderate or severe eyelid irritation" from rabbit eye irritation tests (CERI-NITE Hazard Assessment No.15, 2004).
METHYLENE DI(bis)PHENYLDIISOCYANATE	The eye of the rabbit is stimulated (IARC 19 (1979)).
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	Rabbit/eye(100 mg): moderate irritation

- Respiratory sensitization

DICHLOROMETHANE	No data available
METHYLENE DI(bis)PHENYLDIISOCYANATE	They are classified into the airway 1st group (Japan Society for Occupational Health Recommendation, 2005) according to Japan Society for Occupational Health, and Sah (MAK/BAT, 2004) according to DFG. Since it was listed as a respiratory allergic substance by the Japanese occupational and the allergology meeting (the Japanese occupational and environmental allergology meeting magazine, 2004), it was referred to as Category 1.
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available

- Skin sensitization

DICHLOROMETHANE	No data available
METHYLENE DI(bis)PHENYLDIISOCYANATE	Since it was indicated that a clear proof of skin sensitization was in CICAD 27 (2000) based on the result of Mouse Ear Swelling Test (MEST), it was referred to as Category 1.
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available

- Carcinogenicity

Occupational Health and Safety Act

DICHLOROMETHANE	No data available
METHYLENE DI(bis)PHENYLDIISOCYANATE	No data available
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available

Ministry of Employment and Labor Notice

DICHLOROMETHANE	2
METHYLENE DI(bis)PHENYLDIISOCYANATE	2
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available

IARC

DICHLOROMETHANE	2A
METHYLENE DI(bis)PHENYLDIISOCYANATE	3
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	3

OSHA

DICHLOROMETHANE	No data available
METHYLENE DI(bis)PHENYLDIISOCYANATE	No data available
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available

ACGIH

DICHLOROMETHANE	No data available
METHYLENE DI(bis)PHENYLDIISOCYANATE	No data available
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available

NTP

DICHLOROMETHANE	No data available
METHYLENE DI(bis)PHENYLDIISOCYANATE	No data available
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available

EU CLP

DICHLOROMETHANE	No data available
METHYLENE DI(bis)PHENYLDIISOCYANATE	No data available
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available

- Germ Cell Mutagenicity

DICHLOROMETHANE	Based on negative data on heritable mutagenicity tests (dominant lethal tests) and somatic cell mutagenicity tests in vivo (micronucleus/chromosome aberration tests) and the absence of germ cell mutagenicity tests in vivo, described in CERI-NITE Hazard Assessment No.15 (2004), IARC 71 (1999) and EHC 164 (1996). One testing agency reported that the substance was weakly positive for inhalation toxicity in micronucleus, chromosome aberration and SCE tests in mice, but the responses were weak and considered ambiguous and indecisive in EHC 164 (1996) and thus was not considered "positive".
METHYLENE DI(bis)PHENYLDIISOCYANATE	The substance was regarded as outside the categories. Because there are negative results from the chromosome/micronucleus analysis in human peripheral blood lymphocytes, which is an in vivo mutagenicity test using somatic cells, and the micronucleus test using mouse erythrocytes (DFGOT vol.8, 1997).

ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	In vitro – Salmonella typhimurium/TA98, TA100 (DMSO; Ames test): Positive, (Ethyleneglycol dimethylether; Ames test): Negative
- Reproductive toxicity	
DICHLOROMETHANE	No data available
METHYLENE DI(bis)PHENYLDIISOCYANATE	Since there is the description that there is obvious reproductive toxicity in the dose causing general toxicity to parent animals in rat pregnancy inhalation exposure test (IARC 71 (1999), IRIS (1998) and CICAD 27 (2000)), it was considered as on the outside of Category.
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available
- Specific target organ toxicity (single exposure):	
DICHLOROMETHANE	Based on these effects, the centralnervous system and respiratory organs are considered to be the target organs. Therefore, the substance was classified as Category 1 (central nervous system, respiratory organs) and Category 3 (narcotic effects).
METHYLENE DI(bis)PHENYLDIISOCYANATE	Respiratory irritation to the humans in DFGOT (vol.8, 1997) and IARC 71 (1999).
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available
- Specific target organ toxicity (repeated exposure)	
DICHLOROMETHANE	Based on the human evidence including "intermittent headache, nausea, flickering vision, breathlessness, temporary memory disorder and right brain damage found in electroencephalography" (CERI-NITE Hazard Assessment No.15, 2004) and "cerebroopathy associated with auditory/visionary hallucinations after exposure", "memory disorder associated with intellectual impairment, loss of balance, temporary bilateral degeneration of temporal lobe" (HSDB, 2000) and the evidence from animal studies including "hepatocytes positively stained for fat, mild vacuolation of hepatocytes" and "mutant hepatocytes" (CERI-NITE Hazard Assessment No.15, 2004). The effects on experimental animals were observed at dosing levels within the guidance value ranges for Category 1.
METHYLENE DI(bis)PHENYLDIISOCYANATE	It was classified in Category 1 (respiratory tracts) from the descriptions in IRIS (1998) and CICAD 27 (2000) that the effects on the respiratory system, such as focal/multifocal alveolar and bronchioalveolar hyperplasia, and interstitial fibrosis of lungs were seen with the concentration of the guidance value range of Category 1 in the inhalation exposure test using the rat, and from the descriptions in ACGIH (7th, 2001), DFGOT (vol.8, 1997), CICAD 27 (2000), IARC 71 (1999), and Japan Society for Occupational Health Recommendation of Occupational Exposure Limits (1993) that the respiratory dysfunction and increase in generating of a lung disease were seen in human occupation exposure cases.
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available
- Aspiration hazard	
DICHLOROMETHANE	No data available
METHYLENE DI(bis)PHENYLDIISOCYANATE	No data available
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available

12. Ecological information

A. Aquatic and terrestrial ecotoxicity

- Fish

DICHLOROMETHANE	LC50 5.2 mg/l 72 hr
METHYLENE DI(bis)PHENYLDIISOCYANATE	No data available

ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available
- Shellfish	
DICHLOROMETHANE	EC50 1682 mg/l 48 hr
METHYLENE DI(bis)PHENYLDIISOCYANATE	No data available
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available
- Birds	
DICHLOROMETHANE	No data available
METHYLENE DI(bis)PHENYLDIISOCYANATE	No data available
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available
B. Persistence and degradability	
- Persistence	
DICHLOROMETHANE	log Kow 1.25
METHYLENE DI(bis)PHENYLDIISOCYANATE	No data available
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	log Kow 10.46
- Resolvability	
DICHLOROMETHANE	No data available
METHYLENE DI(bis)PHENYLDIISOCYANATE	No data available
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available
C. Bioaccumulative potential	
- Concentration	
DICHLOROMETHANE	BCF 40
METHYLENE DI(bis)PHENYLDIISOCYANATE	No data available
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available
- Bio resolvability	
DICHLOROMETHANE	13 (%)
METHYLENE DI(bis)PHENYLDIISOCYANATE	No data available
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available
D. Mobility in soil	
DICHLOROMETHANE	No data available
METHYLENE DI(bis)PHENYLDIISOCYANATE	No data available
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available
E. Other adverse effects	
DICHLOROMETHANE	No data available
METHYLENE DI(bis)PHENYLDIISOCYANATE	No data available
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available

13. Disposal considerations

A. Disposal method	Dispose according to the related regulations.
B. Disposal precaution	Follow details of related waste management act.

14. Transport information

A. UN number	2810
B. UN proper shipping name	TOXIC LIQUID, ORGANIC, N.O.S.
C. Transport hazard class:	6.1
D. Packing group (if applicable)	II
E. Marine pollution (yes/no)	Yes
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–A

15. Regulatory information

A. Industrial Safety and Health Act

Management harmful agents	DICHLOROMETHANE, METHYLENE DI(bis)PHENYLDIISOCYANATE
Working environment measurement target material (measurement period: 6 months)	DICHLOROMETHANE, METHYLENE DI(bis)PHENYLDIISOCYANATE
Special medical examination the substance (diagnostic period: 12 months)	DICHLOROMETHANE, METHYLENE DI(bis)PHENYLDIISOCYANATE
Exposure limits set material	DICHLOROMETHANE, METHYLENE DI(bis)PHENYLDIISOCYANATE
No data available	ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER

B. Toxic Chemical Control Act

DICHLOROMETHANE	No data available
METHYLENE DI(bis)PHENYLDIISOCYANATE	Toxicant
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	No data available

C. Dangerous Material Safety Control Act

DICHLOROMETHANE	No data available
METHYLENE DI(bis)PHENYLDIISOCYANATE	No data available
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	The 4th type, the 4st petroleum type 600 ℓ

D. Wastes Management Act

Designated Wastes

E. Other requirements in domestic and other countries

– Domestic regulation

DICHLOROMETHANE	Not Applicable.
METHYLENE DI(bis)PHENYLDIISOCYANATE	Not Applicable.
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	Not Applicable.

– Other countries

USA(OSHA)

DICHLOROMETHANE	Not Applicable.
METHYLENE DI(bis)PHENYLDIISOCYANATE	Not Applicable.
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	Not Applicable.

USA(CERCLA)

DICHLOROMETHANE	453.599 kg 1000 lb
METHYLENE DI(bis)PHENYLDIISOCYANATE	2267.995 kg 5000 lb
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	Not Applicable.

USA(EPCRA 302)

DICHLOROMETHANE	Not Applicable.
METHYLENE DI(bis)PHENYLDIISOCYANATE	Not Applicable.
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	Not Applicable.

USA(EPCRA 304)

DICHLOROMETHANE	Not Applicable.
METHYLENE DI(bis)PHENYLDIISOCYANATE	Not Applicable.
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	Not Applicable.

USA(EPCRA 313)

DICHLOROMETHANE	Applicable.
METHYLENE DI(bis)PHENYLDIISOCYANATE	Applicable.
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	Applicable.

USA (Rotterdam Convention material)

DICHLOROMETHANE	Not Applicable.
METHYLENE DI(bis)PHENYLDIISOCYANATE	Not Applicable.
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	Not Applicable.

USA (Stockholm Convention material)

DICHLOROMETHANE	Not Applicable.
METHYLENE DI(bis)PHENYLDIISOCYANATE	Not Applicable.
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	Not Applicable.

USA (Substance Montreal Protocol)

DICHLOROMETHANE	Not Applicable.
METHYLENE DI(bis)PHENYLDIISOCYANATE	Not Applicable.
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	Not Applicable.

EU (Classification)

DICHLOROMETHANE	Carc. Cat. 3: R40
METHYLENE DI(bis)PHENYLDIISOCYANATE	Carc. Cat.: R40 Xn; R20-48/20 Xi; R36/37/38 R42/43
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	Not Applicable.

EU (Risk Phrases)

DICHLOROMETHANE	R40
METHYLENE DI(bis)PHENYLDIISOCYANATE	R20, R36/37/38, R40, R42/43, R48/20
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	Not Applicable.

EU (Safety Phrases)

DICHLOROMETHANE	S2, S23, S24/25, S36/37
METHYLENE DI(bis)PHENYLDIISOCYANATE	S1/2, S23, S36/37, S45
ISOCYANIC ACID, POLYMETHYLENE POLYLHENYLENE ESTER	Not Applicable.

16. Other information

A. Information source and references

DICHLOROMETHANE

NLM(Oral)

CERI·NITE No.15 (2004)(Inhalation)

EHC 164 (1996)(Fish)

METHYLENE DI(bis)PHENYLDIISOCYANATE

CICAD(Oral)

ACGIH(Inhalation)

ISOCYANIC ACID, POLYMETHYLENE POLYLHENELENE ESTER

Corporate Solution From Thomson Micromedex(<http://csi.micromedex.com>)(Oral)

Corporate Solution From Thomson Micromedex(<http://csi.micromedex.com>)(Dermal)

Corporate Solution From Thomson Micromedex(<http://csi.micromedex.com>)(Inhalation)

Corporate Solution From Thomson Micromedex(<http://csi.micromedex.com>)(Serious eye damage or eye irritation)

OECD Screening Information Data Set(<http://cs3-hq.oecd.org/scripts/hpv/>)(Reproductive toxicity)

International Programme on Chemical Safety(IPCS INCHEM)(<http://www.inchem.org/>)(Specific target organ toxicity(single exposure))

International Programme on Chemical Safety(IPCS INCHEM)(<http://www.inchem.org/>)(Specific target organ toxicity(repeated exposure))

Quantitative Structure Activity Relation(QSAR)(Persistence)

B. Issuing date

February 15, 2016

C. Revision number and date

Revision number

Date

D. Others