

MATERIAL SAFETY DATA SHEET

1. Identification of the substance or mixture and of the supplier

- A. GHS product identifier** FIRST CLASS SWIRL REMOVER
- B. Recommended use of the chemical and restrictions on use**
Recommended use removing scratch or stain of the car surface
Restrictions on use Limitation of use for other purpose
- C. Manufacturers**
Company name BULLSONE
Address 890-12 Dabong Tower, Daechi-dong Gangnam-gu Seoul Korea
Emergency phone number 822-2106-7777
Respondent Han Dong Jin
Fax 822-2106-7911

2. Hazards identification

- A. GHS classification of the substance/mixture**
 Flammable liquids : Category 3
 Skin corrosion/irritation : Category 2
 Serious eye damage /eye irritation : Category 2A
 Hazardous to the aquatic environment (acute hazard) : Category 2
 Hazardous to the aquatic environment (chronic) : Category 3

B. GHS label elements, including precautionary statements

Pictogram and symbol :



Signal word : Warning

Hazard statements :

- H226 Flammable liquid and vapour
- H315 Causes skin irritation.
- H319 Causes serious eye irritation
- H401 Toxic to aquatic life.
- H412 Harmful to aquatic life with long lasting effects.

Precautionary statements

Precaution

- P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
- P233 Keep container tightly closed.
- P240 Ground/bond container and receiving equipment.
- P241 Use explosion-proof electrical/ventilating/lighting equipment.
- P242 Use only non-sparking tools.
- P243 Take precautionary measures against static discharge.
- P264 Wash thoroughly after handling.
- P273 Avoid release to the environment.
- P280 Wear protective gloves/protective clothing/eye protection/face protection.

Treatment

- P302+P352 If on skin: Wash with plenty of soap and water.
- P303+P361+P353 If on skin (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P321 Specific treatment (seems on this label).
 P332+P313 If skin irritation occurs: Get medical advice/ attention.
 P337+P313 If eye irritation persists: Get medical advice/attention.
 P362 Take off contaminated clothing and wash before reuse.
 P370+P378 In case of fire: Use fire-extinguishing agents for extinction.

Storage

P403+P235 Store in a well-ventilated place. Keep cool.

Disposal

P501 Dispose the contents/container in accordance with local/regional/national/international regulations.

C. Other hazard information not included in hazard classification (NFPA)

Health 2

Flammability 1

Reactivity Not available

3. Composition/information on ingredients

Chemical Name	Common Name(Synonyms)	CAS number	EC number	Content (%)
aluminum silicate flux		66402-68-4	266-340-9	10~20
OLEIC ACID	Octadecenoic acid	112-80-1	204-007-1	1~5
Naphtha (petroleum), hydrodesulfurized heavy		64742-82-1	265-185-4	10~20
Polysiloxane	Silicone oil	63148-62-9	613-156-5	1~5
Tetrahydro-2H-1,4-oxazine	Tetrahydro-2H-1,4-oxazine	110-91-8	203-815-1	1~5
Modified acrylic copolymer				0.1~1
Water		7732-18-5	231-791-2	50~70

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.
- Call emergency medical service.
- Remove and isolate contaminated clothing and shoes.
- For minor skin contact, avoid spreading material on unaffected skin.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Wash skin with soap and water.

C. Inhalation

- Move victim to fresh air.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Keep victim warm and quiet.

D. Ingestion

- Call emergency medical service.

E. Indication of immediate medical attention and notes for 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

- Use alcohol foam, carbon dioxide, or water spray when fighting fires involving this material.
- Use dry sand or earth to smother fire.

B. Specific hazards arising from the chemical

- Flammable liquid and vapour
- May violently polymerize and result in fire and explosion.
- Vapors may travel to a source of ignition and ignite.
- Material may produce irritating and highly toxic gases from decomposition by heat and combustion during burning
- May form explosive mixtures at temperatures at or above the flashpoint.
- Containers may explode when heated.
- HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
- Spilled material may create fire or explosion hazard.
- May cause vapor explosion hazard indoors, outdoors or in sewers.
- Some of these materials may burn, but none ignite readily.
- Vapors may form explosive mixtures with air.
- Non-combustible, substance itself does not burn but may decompose upon heating, then produce corrosive and/or toxic fumes.

C. Special protective equipment and precautions for fire-fighters

- Rescuers should put on appropriate protective gear.
- Evacuate area and fight fire from a safe distance.
- Many liquids are lighter than water.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas
- Substance may be transported hot.
- Substance may be transported in a molten form.
- Some may be transported hot.
- Dike fire-control water for later disposal; do not scatter the material.
- Move containers from fire area if you can do it without risk.
- Fire involving Tanks; Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Fire involving Tanks; Cool containers with flooding quantities of water until well after fire is out.
- Fire involving Tanks; Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- Fire involving Tanks; Always stay away from tanks engulfed in fire.
- Fire involving Tanks; For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

6. Accidental release measures

A. Personal precautions, protective equipment and emergency procedures

- The very fine particles may cause a fire or explosion, eliminate all ignition sources.
- Clean up spills immediately, observing precautions in Protective Equipment section.
- Eliminate all ignition sources.
- 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.
- A vapor suppressing foam may be used to reduce vapors.
- Cover with plastic sheet to prevent spreading.
- Prevent dust cloud.
- Please note that there are materials and conditions to avoid.

B. Environmental precautions and protective procedures

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

C. The methods of purification and removal

- Dike and collect water used to fight fire.

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

7. Handling and storage

A. Precautions for safe handling

- Use explosion-proof electrical/ventilating/lighting equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- Wash thoroughly after handling.
- Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition.
- Follow all MSDS/label precautions even after container is emptied because they may retain product residues.
- Avoid prolonged or repeated contact with skin.
- All equipment used when handling the product must be grounded.
- Please note that there are materials and conditions to avoid.
- Please work with reference to engineering controls and personal protective equipment.
- Be careful to high temperature.
- Be careful to heat.
- You need measurement of air concentration and ventilation in low, closed and confined areas due to lack of oxygen.

B. Conditions for safe storage

- Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
- Keep container tightly closed.
- Store in a well-ventilated place. Keep cool.
- Empty drums should be completely drained, properly bunged, and promptly returned to a drum reconditioner, or properly disposed of.

8. Exposure controls/personal protection

A. Occupational Exposure limits

Korea regulation

Tetrahydro-2H-1,4-oxazine TWA = 20 ppm (70 mg/m³), STEL = 30 ppm (105 mg/m³) Skin

ACGIH regulation

Tetrahydro-2H-1,4-oxazine TWA 20 ppm

Biological exposure index : Not available

OSHA regulation

Tetrahydro-2H-1,4-oxazine TWA = 20 ppm (70 mg/m³)

NIOSH regulation

Tetrahydro-2H-1,4-oxazine STEL = 30 ppm (105 mg/m³), TWA = 20ppm(70 mg/m³)

EU regulation : Not available

Other

OLEIC ACID Bulgaria : 10.0 mg/m³

Tetrahydro-2H-1,4-oxazine Australia : TWA = 20 ppm (71 mg/m³) Belgium : TWA = 10 ppm (36 mg/m³) Canada : TWA= 20 ppm(71 mg/m³) Denmark : TWA = 10 ppm (36 mg/m³) Colombia : TWA = 20 ppm

Modified acrylic copolymer the industry-recommended permissible exposure limit for respirablepolyacrylate dusts is 0.05 mg/m³.

B. Appropriate engineering controls

- Facilities for storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

C. Personal protective equipment**Respiratory protection**

- Wear NIOSH or European Standard EN 149 approved full or half face piece (with goggles) respiratory protective equipment when necessary.
- In case exposed to gaseous/liquid material, the respiratory protective equipments as follow are recommended. escape full facepiece gas mask (of use for acid gas, in case of acid gas for organic compounds) or escape half facepiece gas mask (of use for acid gas, in case of acid gas for organic compounds) or direct full facepiece gas mask (of use for acid gas, in case of acid gas for organic compounds) half facepiece gas mask (of use for acid gas, in case of acid gas for organic compounds) or powered air-purifying gas mask.
- In lack of oxygen(< 19.5%), wear the supplied-air respirator or self-contained breathing apparatus.oxygen

Eye protection

- Wear enclosed safety goggles to protect from gaseous state organic material causing eye irritation or other disorder.
- An eye wash unit and safety shower station should be available nearby work place.

Hand protection

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

Body protection

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

9. Physical and chemical properties**A. Appearance****Description** Liquid**Color** white**B. Odor****C. Odor threshold** Not available**D. pH** 9.0 ± 0.5 **E. Melting point/freezing point** $-1 \text{ }^{\circ}\text{C} \sim 0 \text{ }^{\circ}\text{C}$ **F. Initial boiling point and boiling range** $99 \text{ }^{\circ}\text{C} \sim 100 \text{ }^{\circ}\text{C}$ **G. Flash point** Not available**H. Evaporation rate** Not available**I. Flammability (solid, gas)** Not applicable**J. Upper/lower flammability or explosive limits** Not available**K. Vapor pressure** Not available**L. Solubility (ies)** Not available**M. Vapor density** Not available**N. Specific gravity** 1.000 ± 0.02 **O. Partition coefficient: n-octanol/water** Not available**P. Auto ignition temperature** Not available**Q. Decomposition temperature** Not available**R. Viscosity** 600 cP**S. Molecular weight** Not available**10. Stability and reactivity****A. Chemical stability and Possibility of hazardous reactions:**

- Flammable liquid and vapour
- May violently polymerize and result in fire and explosion.
- May form explosive mixtures at temperatures at or above the flashpoint.
- Containers may explode when heated.
- HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.

- Spilled material may create fire or explosion hazard.
- May cause vapor explosion hazard indoors, outdoors or in sewers.
- Some of these materials may burn, but none ignite readily.
- Vapors may form explosive mixtures with air.
- Non-combustible, substance itself does not burn but may decompose upon heating, then produce corrosive and/or toxic fumes.
- Fire will produce irritating, corrosive and/or toxic gases.

B. Conditions to avoid:

- Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

C. Incompatible materials:

- Combustibles, reducing agents

D. Hazardous decomposition products:

- Material may produce irritating and highly toxic gases from decomposition by heat and combustion during burning
- Corrosive and/or toxic fume
- Irritating and/or toxic gases

11. Toxicological information

A. Information of Health Hazardous:

Acute toxicity

Oral [Not classified] (ATEmix = 69,852.94 mg/kg bw)

- **Antimony oxide calcium titanate** : Rat LD₅₀ > 2,000 mg/kg (암컷, OECD TG 425, GLP, read-across; CAS No. 1305-78-8)
- **OLEIC ACID** : Rat LD₅₀ = 2,500 mg/kg
- **Naphtha (petroleum), hydrodesulfurized heavy** : Rat LD₅₀ > 5,000 mg/kg (OECD TG 401, GLP)
- **Polysiloxane** : Rat LD₅₀ > 5,000 mg/kg
- **Tetrahydro-2H-1,4-oxazine** : Rat LD₅₀ = 1,900 mg/kg (OECD TG 401)

Dermal [Not classified] (ATEmix = 41,666.67 mg/kg bw)

- **Antimony oxide calcium titanate** : Rabbit LD₅₀ > 2,500 mg/kg (OECD TG 402, read-across; CAS No. 7719-01-9)
- **OLEIC ACID** : Guinea pig LD₅₀ > 3,000 mg/kg
- **Naphtha (petroleum), hydrodesulfurized heavy** : Rabbit LD₅₀ > 2,000 mg/kg (OECD TG 402, GLP)
- **Polysiloxane** : Rabbit LD₅₀ > 10,000 mg/kg Acute toxicity is very low
- **Tetrahydro-2H-1,4-oxazine** : Rabbit LD₅₀ = 500 mg/kg (male)(OECD TG 402)
- **Modified acrylic copolymer** : LD₅₀ > 2,000 mg/kg

Inhalation [Not classified] (ATEmix = 1,846.67 mg/L)

- **Antimony oxide calcium titanate** : Rat LC₅₀ > 3.5 mg/L/4hr (OECD TG 403, GLP, read-across ; CAS No. 1302-67-6)
- **Naphtha (petroleum), hydrodesulfurizedheavy** : Rat LC₅₀ > 5.16 mg/L/4hr (OECD TG 403, GLP)
- **Polysiloxane** : Rat LC₅₀ > 535 mg/L Acute toxicity is very low
- **Tetrahydro-2H-1,4-oxazine** : Rat LC₅₀ = 22.16 mg/L/4hr (conversion:18.1mg/L /6h)((OECD TG 403)

Skin corrosion/ irritation [Category 2]

- **Antimony oxide calcium titanate** : In test on skin irritation with rabbits, skin irritations were not observed.(OECD TG 431, GLP)
- **OLEIC ACID** : Oleic acid were considered slightly to moderately irritating.
- **Naphtha (petroleum), hydrodesulfurizedheavy** : In skin irritation test with rabbits, skin irritations were observed.(OECD TG 404, GLP)
- **Polysiloxane** : In test on skin irritation with rabbits, skin irritations were not observed.
- **Tetrahydro-2H-1,4-oxazine** : The application of the test substance for 1 min caused in 1 animal haemorrhagic areas and leathery-like necrosis at the end of the observation period. The application

for 5 min caused after 24 hours parchment-like necrosis in 1 animal and haemorrhagic areas after 24 hours and leathery-like necrosis after 8 days. The application of the test substance for 15 min caused haemorrhagic areas, oedema and parchment-like necrosis after 24 hours which declined to leathery-like necrosis after 8 days. (OECD TG 404, GLP)

- **Modified acrylic copolymer** : Not expected to be a primary skin irritant. Based on data from components or similar materials. Prolonged or repeated contact may cause dermatitis. Contact dermatitis may occur in sensitive individuals under extreme and unusual conditions of prolonged and repeated contact, such as high exposure accompanied by elevated temperature and occlusion by clothing. This effect may be the result of the product's hygroscopic properties, abrasion, or pH.

Serious eye damage/ irritation [Category 2A]

- **Antimony oxide calcium titanate** : In test on eyes irritation with rabbits, eyes irritations were not observed. (OECD TG 405)

- **OLEIC ACID** : Irritating to eyes.

- **Naphtha (petroleum), hydrodesulfurized heavy** : In test on eyes irritation with rabbits, eyes irritations were not observed. (OECD TG 405, GLP)

- **Polysiloxane** : In test on eyes irritation with rabbits, eyes irritations were not observed.

- **Tetrahydro-2H-1,4-oxazine** : In eye irritation test with rabbit, all animals showed necrosis in and around the eyes. After an exposure time of 24 hours burns (corrosion) were observed. After the observation period eye injuries were observed in one animal. Corrosive effects in several animals were observed. (OECD TG 405, GLP) (chemosis score : 1~2.3, cornea score : 1.3~1.6, iris score : 0~0.3)

- **Modified acrylic copolymer** : Moderate to strong eye irritant. Based on data from components or similar materials. Particulates may cause mechanical irritation. Solid particles (powder or dust) on the eye may cause pain and irritation.

Respiratory sensitization [Not classified]

- **Modified acrylic copolymer** : No data available to indicate product or components may be respiratory sensitizers.

Skin sensitization [Not classified]

- **Antimony oxide calcium titanate** : In test on skin sensitization mouse, skin sensitization were not observed. (OECD TG 429, GLP)

- **Naphtha (petroleum), hydrodesulfurized heavy** : In sensitisation test with guinea pigs, skin sensitisation were not observed. (OECD TG 406, GLP)

- **Polysiloxane** : In skin sensitisation test with animals, skin sensitization were not observed.

- **Tetrahydro-2H-1,4-oxazine** : In skin sensitization test with guinea pigs, skin sensitization was not observed.

- **Modified acrylic copolymer** : Not expected to cause skin sensitization. Based on data from components or similar materials.

Carcinogenicity [Not classified]

IARC

- **Tetrahydro-2H-1,4-oxazine** : Group 3

ACGIH

- **Tetrahydro-2H-1,4-oxazine** : A4

EU

- **Naphtha (petroleum), hydrodesulfurized heavy** : Carc. 1B

Antimony oxide calcium titanate: In test on carcinogenicity with guinea pigs, carcinogenicity was not observed. (OECD TG 413)

Naphtha (petroleum), hydrodesulfurized heavy : In a carcinogenicity with mouse, unleaded gasoline is not expected to display carcinogenic properties. (OECD TG 451)

Tetrahydro-2H-1,4-oxazine : There was no evidence of increased incidence of carcinogenesis due to chronic Morpholine inhalation. (OECD TG 453, GLP)

Mutagenicity [Not classified]

- **Antimony oxide calcium titanate** : Negative reactions were observed in, in vitro (Bacterial reverse mutation assay, OECD TG 471, GLP, read-across; CAS No. 1302-67-6, 1305-78-8; in vitro mammalian chromosome aberration test, read-across; CAS No. 1305-62-0; mammalian cell gene

mutation assay, OECD TG 476, GLP, read-across; CAS No. 21645-51-2; Neutral comet assay(without metabolic activation), read-across; CD4+T cells). Positive reactions were observed in, in vitro(in vitro mammalian chromosome aberration test(without metabolic activation), OECD TG 473, read-across; CAS No. 7466-70-0; in vitro mammalian cell micronucleus test(without metabolic activation), OECD TG 487,read-across; Al₂(SO₄)₃) and in vivo(female, Mammalian Erythrocyte Micronucleus Test(for the nano-sized materials (30 and 40 nm) with evidence of a dose-response relationship for MN), OECD TG, 474, read-across; 1344-28-1; female, chromosome aberration assay(for the nano-sized materials with evidence of a positive dose-response relationship for CAs), OECD TG 475, read-across; 1344-28-1).

- **OLEIC ACID** : Negative reactions were observed in Ames test.

- **Naphtha (petroleum), hydrodesulfurizedheavy** : Negative reactions were observed in vitro test(Bacterial gene mutation assay and mammalian cell gene mutation assay)and in vivo test(Erythrocyte Micronucleus Assay(GLP) and Mammalian Bone Marrow Chromosome Aberration Test(OECD TG 475)).

-**Polysiloxane** : Ames test results negative

- **Tetrahydro-2H-1,4-oxazine** : Negative reactions were observed in vitro(unscheduled DNA synthesis(OECD TG 482), Sister Chromatid Exchange Assay in Mammalian Cells(OECD TG 479))and both negative and positive reactions were observed in vitro-Mammalian chromosome aberration test). Negative reaction was observed in in vivo-chromosome aberration assay and micronucleus test.

- **Modified acrylic copolymer** : No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Reproductive toxicity [Not classified]

- **Antimony oxide calcium titanate** : In reproductive toxicity test(OECD TG 426 and 452, GLP, read-across; CAS No. 31142-56-0; OECD TG 422, GLP, read-across; 1327-41-9) and developmental toxicity test(OECD TG 414, read-across; CAS No. 1305-78-8; OECD TG 426 and 452, GLP, read-across; CAS No. 31142-56-0) with rats, there were no significant effects.

- **Naphtha (petroleum), hydrodesulfurizedheavy** : In developmental inhalation toxicity study with rats, unleaded gasoline vapors did not produce evidence of developmental toxicity.(OECD TG 414, GLP)

- **Tetrahydro-2H-1,4-oxazine** : There were no substance-related spontaneous mortalities. liver cells and liver cell metabolism was observed, but It had no influence on gestation. specific skeletal variations mirror common minor effects on fetal morphology which are considered to be transient in nature. Thus it was regarded to be of no toxicological relevance (OECD TG 414, GLP, read-across ;Morpholine hydrochloride)

- **Modified acrylic copolymer** : No data available to indicate either product or components present at greater than 0.1% that cause reproductive toxicity.

Specific target organ toxicity (single exposure) [Not classified]

- **Antimony oxide calcium titanate** : In acute inhalation toxicity with rats, slight respiratory distress effect was observed; all signs had resolved within 14days.(OECD TG 403)

- **Naphtha (petroleum), hydrodesulfurized heavy** : In acute inhalation toxicity study with rats, There were no remarkable clinical signs noted during the course of treatment and no mortality.(OECD TG 403, GLP)

- **Tetrahydro-2H-1,4-oxazine** : In acute oral toxicity test with rats, all animals were subjected to necropsy.(OECD TG 401, GLP)

- **Modified acrylic copolymer** : - Oral Toxicity : LD₅₀ is Based on data from components or similar materials. Swallowing material may cause irritation of the gastrointestinal lining, nausea, vomiting, diarrhea, and abdominal pain. - Inhalation Toxicity : Avoid inhalation of dust. Animal studies indicate the inhalation of respirablepolyacrylate dust may cause inflammatory changes in the lung. - Respiratory Irritation : May causes nose, throat, and lung irritation. Based on data from components or similar materials. Exposure to a dust may be irritating. Breathing of dust may cause coughing, mucous production, and shortness of breath.

Specific target organ toxicity (repeat exposure) [Not classified]

- **Antimony oxide calcium titanate** : In an oral repeated dose toxicity study with rats during the postnatal period, clinical signs(mild alopecia and porphyrin staining, slight dehydration, diarrhoea) were observed.

- **Naphtha (petroleum), hydrodesulfurizedheavy** : In repeated dose inhalation toxicity study with rat and mouse, No compound-related changes were seen in mortality, hematology or clinical

chemistry parameters in either species.(OECD TG 453)

- **Tetrahydro-2H-1,4-oxazine** : In toxic oral test with rat,no animal of the test group and of the control group died within the study period of 56 days. After 270 days had elapsed,the only symptom was moderate adiposis of the liver through an autopsy of them.

- **Modified acrylic copolymer** : A two-year inhalation study in rats exposed to a respirable, water-absorbent sodium polyacrylate dust resulted in lung effects such as inflammation, hyperplasia, and tumors. However, the inhalation of respirable dusts should be avoided by implementing respiratory protection measures and observing the recommended permissible exposure limit of 0.05 mg/m³.

Aspiration Hazard [Not classified]

- **Modified acrylic copolymer** : - Avoid inhalation of dust. Animal studies indicate the inhalation of respirable polyacrylate dust may cause inflammatory changes in the lung.

12. Ecological information

A. Ecological toxicity

- Acute toxicity : [Category 2] (ATEmix = 3.05643mg/l)

- Chronic toxicity : [Category 3]

Fish

- **OLEIC ACID** : 96hr-LC₅₀ (*Pimephalespromelas*) = 205 mg/L

- **Naphtha (petroleum), hydrodesulfurized heavy** : 96hr-LC₅₀ = 2.5 mg/L

- **Tetrahydro-2H-1,4-oxazine** : 96hr-LC₅₀ = 179 mg/L (*Chelonengeli*)

- **Modified acrylic copolymer** : LC₅₀ = 10 ~ 100 mg/L

crustacean

- **Naphtha (petroleum), hydrodesulfurizedheavy** : 96hr-LC₅₀ (other) = 4.3 mg/L

- **Tetrahydro-2H-1,4-oxazine** : 48hr-EC₅₀ = 45 mg/L (OECD TG 202), 21d-NOEC (*Daphnia magna*) = 5 mg/L (OECD TG 211)

- **Modified acrylic copolymer** : EC₅₀ = 10 ~ 100 mg/L

Algae

- **Tetrahydro-2H-1,4-oxazine** : 96hr-EC₅₀ (*Selenastrumcapricornutum*) = 28 mg/L

B. Persistence and degradability

Persistence

- **OLEIC ACID** : High persistency (log Kow is more than 4 estimated.) (Log Kow = 7.64)

- **Naphtha (petroleum), hydrodesulfurizedheavy** : High persistency (log Kow is more than 4 estimated.) (Log Kow = 2.1 ~ 6)

- **Tetrahydro-2H-1,4-oxazine** : Low persistency (log Kow is less than 4 estimated.) (Log Kow = -0.56) (estimated)

Degradability Not available

C. Bioaccumulative potential

Bioaccumulation

- **OLEIC ACID** : Bioaccumulation is expected to be low according to the BCF < 500 (BCF = 56.23) (estimated)

- **Naphtha (petroleum), hydrodesulfurized heavy** : Bioaccumulation is expected to be high according to the BCF ≥ 500 (BCF = 10 ~ 2500)

- **Tetrahydro-2H-1,4-oxazine** : Bioaccumulation is expected to be low according to the BCF < 500 (BCF ≤ 0.65)

- **Modified acrylic copolymer** : Less than 1.0% of the components potentially bioconcentrate, based on octanol/water coefficients.

Biodegradation

- **Antimony oxide calcium titanate** : This substance is not considered to be biodegradable.

- **Naphtha (petroleum), hydrodesulfurized heavy** : As well-biodegraded, it is expected to have low accumulation potential in living organisms (= 77.05% biodegradation was observed after 28 days) (OECD TG 301F, GLP)

- **Tetrahydro-2H-1,4-oxazine** : As well-biodegraded, it is expected to have low accumulation potential in living organisms (= 95.2% biodegradation was observed after 28 days)

- **Modified acrylic copolymer** : As not well-biodegraded, it is expected to have high accumulation potential in living organisms (= 25% biodegradation was observed after 28 days) (OECD TG 301, 302)

D. Mobility in soil

- **OLEIC ACID** : Low potency of mobility to soil. (Koc = 5.151)
- **Naphtha (petroleum), hydrodesulfurizedheavy** : High potency of mobility to soil. (Koc = 80030) (estimated)
- **Tetrahydro-2H-1,4-oxazine** : Low potency of mobility to soil. (Koc = 0.2401)
- E. Other hazardous effect**
- **Modified acrylic copolymer** : Physical and chemical Properties; Percent Volatile:

13. Disposal considerations

A. Disposal method

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

B. Disposal precaution

- Consider the required attentions in accordance with waste treatment management regulation.

14. Transport information

A. UN Number 1993

B. UN Proper shipping name FLAMMABLE LIQUID, N.O.S.

C. Transport Hazard class 3

D. Packing group III

E. Marine pollutant NO

F. Special precautions

in case of fire F-E

in case of leakage S-E

15. Regulatory information

A. Occupational Safety and Health Regulation

Tetrahydro-2H-1,4-oxazine : Occupational exposure limits listed

Tetrahydro-2H-1,4-oxazine : Occupational exposure limits listed

B. Toxic Chemical Control Act

Antimony oxide calcium titanate :Existing Chemical Substance (KE-05377)

OLEIC ACID :Existing Chemical Substance (KE-26450)

Naphtha (petroleum), hydrodesulfurizedheavy :Existing Chemical Substance (KE-25620)

Polysiloxane :Existing Chemical Substance (KE-31068)

Tetrahydro-2H-1,4-oxazine : Existing Chemical Substance (KE-33492)

Water :Existing Chemical Substance (KE-35400)

C. Dangerous Material Safety Management Regulation

OLEIC ACID :Dangerous Material Safety Management Regulation 4000ℓ

D. Wastes Control Act

Not regulated

E. Other regulation (internal and external)

Internal information

Persistent Organic Pollutants Acts Not regulated

External information

EU classification(classification)

Antimony oxide calcium titanate :Classification Not classified

OLEIC ACID :Classification Not classified

Naphtha (petroleum), hydrodesulfurizedheavy :Classification Carc. Cat. 2; R45 Muta. Cat. 2; R46 Xn; R65

Tetrahydro-2H-1,4-oxazine : Classification R10, Xn; R20/21/22, C; R34

Water :Classification Not classified

EU classification(risk phrases)

Antimony oxide calcium titanate :Hazard statements Not applicable

OLEIC ACID :Hazard statements Not applicable

Naphtha (petroleum), hydrodesulfurizedheavy :Hazard statements R45 R46 R65

Tetrahydro-2H-1,4-oxazine : Hazard statements R10, R20/21/22, R34

Water :Hazard statements Not applicable

EU classification(safety phrases)

Antimony oxide calcium titanate :Precautionary statements Not applicable

OLEIC ACID :Precautionary statements Not applicable

Naphtha (petroleum), hydrodesulfurizedheavy :Precautionary statements S53 S45

Tetrahydro-2H-1,4-oxazine : Precautionary statements S(1/2), S23, S36, S45

Water :Precautionary statements Not applicable

EU SVHC list Not regulated

EU Authorisation List Not regulated

EU Restriction list

Naphtha (petroleum), hydrodesulfurizedheavy :EU Restriction list Regulated

U.S.A management information (OSHA Regulation) Not regulated

U.S.A management information (CERCLA Regulation) Not regulated

U.S.A management information (EPCRA 302 Regulation) Not regulated

U.S.A management information (EPCRA 304 Regulation) Not regulated

U.S.A management information (EPCRA 313 Regulation) Not regulated

Substance of Roterdame Protocol Not regulated

Substance of Stockholme Protocol Not regulated

Substance of Montreal Protocol Not regulated

Foreign Inventory Status

Antimony oxide calcium titanate

OLEIC ACID

U.S.A management information Section 8(b) Inventory (TSCA): Present

Japan management information Existing and New Chemical Substances (ENCS): (2)-975; (2)-609

China management information Inventory of Existing Chemical Substances (IECSC): Present

Canada management information Domestic Substances List (DSL): Present

Australia management information Inventory of Chemical Substances (AICS): Present

New Zealand management information Inventory of Chemicals (NZIoC): HSNO Approval: HSR003153

Philippines management information Inventory of Chemicals and Chemical Substances (PICCS): Present

Naphtha (petroleum), hydrodesulfurized heavy

U.S.A management information Section 8(b) Inventory (TSCA): Present

Japan management information Existing and New Chemical Substances (ENCS): (9)-1698

China management information Inventory of Existing Chemical Substances (IECSC): Present

Canada management information Domestic Substances List (DSL): Present

Australia management information Inventory of Chemical Substances (AICS): Present

New Zealand management information Inventory of Chemicals (NZIoC): May be used as a single component chemical under an appropriate group standard.

Philippines management information Inventory of Chemicals and Chemical Substances (PICCS): Present

Polysiloxane

U.S.A management information Section 8(b) Inventory (TSCA): Present [XU]

Japan management information Existing and New Chemical Substances (ENCS): (7)-476

China management information Inventory of Existing Chemical Substances (IECSC): Present 08512

Canada management information Domestic Substances List (DSL): Present

Australia management information Inventory of Chemical Substances (AICS): Present

New Zealand management information Inventory of Chemicals (NZIoC): Inventory of Chemicals (NZIoC): HSNO Approval: HSR003036

Philippines management information Inventory of Chemicals and Chemical Substances (PICCS): Present

Tetrahydro-2H-1,4-oxazine

U.S.A management information Section 8(b) Inventory (TSCA): Present

Japan management information Existing and New Chemical Substances (ENCS): (5)-859

China management information Inventory of Existing Chemical Substances (IECSC): Present 24854

Canada management information Domestic Substances List (DSL): Present

Australia management information Inventory of Chemical Substances (AICS): Present

New Zealand management information Inventory of Chemicals (NZIoC): HSNO Approval: HSR001204

Philippines management information Inventory of Chemicals and Chemical Substances (PICCS): Present

Modified acrylic copolymer

U.S.A management information Section 8(b) Inventory (TSCA): Present or exempt
 Japan management information Existing and New Chemical Substances (ENCS): Present
 China management information Inventory of Existing Chemical Substances (IECSC): Present
 Canada management information Domestic Substances List (DSL): Present
 Australia management information Inventory of Chemical Substances (AICS): Present
 New Zealand management information may require notification before sale under new zealand regulation.
 Philippines management information Inventory of Chemicals and Chemical Substances (PICCS): Present
 Bulk Quantity 85000 KG, 187391 Ibs
 Non-Bulk Quantity 207.8 KG, 458 Ibs

Water

U.S.A management information Section 8(b) Inventory (TSCA): Present
 Japan management information Industrial Safety and Health Law Substances (ISHL): 2-(4)-1220
 China management information Inventory of Existing Chemical Substances (IECSC): Present 32224
 Canada management information Domestic Substances List (DSL): Present
 Australia management information Inventory of Chemical Substances (AICS): Present
 New Zealand management information Inventory of Chemicals (NZIoC): May be used as a single component chemical under an appropriate group standard.
 Philippines management information Inventory of Chemicals and Chemical Substances (PICCS): Present

16. Other information

A. Information source and references

AKRON; <http://ull.chemistry.uakron.edu/erd>
 International Uniform Chemical Information Database(IUCLID); <http://esis.jrc.ec.europa.eu/> (Initial boiling point and boiling range) , (Solubility (ies)) , (Specific gravity) , (Molecular weight)
 Korea Occupational Health & Safety Agency; <http://www.kosha.net>
 National Chemicals Information System; <http://ncis.nier.go.kr/ncis/>
 National Emergency Management Agency-Korea dangerous material inventory management system; <http://www.nema.go.kr/hazmat/main/main.jsp>
 REACH information on registered substances; <http://apps.echa.europa.eu/registered/registered-sub.aspx> (Color) , (Odor) , (Melting point/freezing point) , (Oral) , (Dermal) , (Inhalation) , (Skin corrosion/ irritation) , (Serious eye damage/ irritation) , (Skin sensitization) , (Carcinogenicity) , (Mutagenicity) , (Reproductive toxicity) , (Specific target organ toxicity (single exposure)) , (Specific target organ toxicity (repeat exposure))
 Waste Control Act enforcement regulation attached [1]
 American Conference of Governmental Industrial Hygienists TLVs and BEIs.
 ECOTOX; <http://cfpub.epa.gov/ecotox/> (Fish)
 EPISUITE v4.1; <http://www.epa.gov/opt/exposure/pubs/episuitedl.htm> (Bioaccumulation) , (Mobility in soil)
 EU CLP; <http://esis.jrc.ec.europa.eu/index.php?PGM=cla>
 IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; <http://monographs.iarc.fr>
 Korea Occupational Health & Safety Agency; <http://www.kosha.net>
 NIOSH Pocket Guide; <http://www.cdc.gov/niosh/npg/npgdcas.html>
 National Chemicals Information System; <http://ncis.nier.go.kr/ncis/>
 National Emergency Management Agency-Korea dangerous material inventory management system; <http://www.nema.go.kr/hazmat/main/main.jsp>
 National Toxicology Program; http://ntp-apps.niehs.nih.gov/ntp_tox/index.cfm
 TOMES-LOLI®; <http://www.rightanswerknowledge.com/loginRA.asp>
 The Chemical Database -The Department of Chemistry at the University of Akron; <http://ull.chemistry.uakron.edu/erd/> (Flash point) , (Upper/lower flammability or explosive limits) , (Vapor density) , (Auto ignition temperature)
 U.S. National library of Medicine(NLM) ChemIDplus; <http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?CHEM> (Oral)
 U.S. National library of Medicine(NLM) Chemical Carcinogenesis Research Information System(CCRIS); <http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?CCRIS> (Mutagenicity)
 U.S. National library of Medicine(NLM) Hazardous Substances Data Bank(HSDB); <http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB> (Description) , (Color) , (Odor) , (Melting point/freezing point) , (Initial boiling point and boiling range) , (Vapor pressure) , (Solubility (ies)) ,

(Specific gravity) , (Partition coefficient: n-octanol/water) , (Viscosity) , (Molecular weight) , (Dermal) , (Skin corrosion/ irritation) , (Serious eye damage/ irritation) , (Persistence)
Waste Control Act enforcement regulation attached [1]
American Conference of Governmental Industrial Hygienists TLVs and BEIs.
EPISUITE v4.1; <http://www.epa.gov/opt/exposure/pubs/episuitedl.htm> (Mobility in soil)
EU CLP; <http://esis.jrc.ec.europa.eu/index.php?PGM=cla>
Emergency Response Guidebook 2008;
http://phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/erg2008_eng.pdf
IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; <http://monographs.iarc.fr>
International Uniform Chemical Information Database(IUCLID); <http://esis.jrc.ec.europa.eu/>
(crustacean) , (Persistence)
Korea Occupational Health & Safety Agency; <http://www.kosha.net>
NIOSH Pocket Guide; <http://www.cdc.gov/niosh/npg/npgdcas.html>
National Chemicals Information System; <http://ncis.nier.go.kr/ncis/>
National Emergency Management Agency-Korea dangerous material inventory management system;
<http://www.nema.go.kr/hazmat/main/main.jsp>
National Toxicology Program; http://ntp-apps.niehs.nih.gov/ntp_tox/index.cfm
OECD SIDS; <http://webnet.oecd.org/hpv/ui/Search.aspx> (Fish)
REACH information on registered substances; <http://apps.echa.europa.eu/registered/registered-sub.aspx> (Upper/lower flammability or explosive limits) , (Vapor pressure) , (Specific gravity) , (Auto ignition temperature) , (Oral) , (Dermal) , (Inhalation) , (Skin corrosion/ irritation) , (Serious eye damage/ irritation) , (Skin sensitization) , (Carcinogenicity) , (Mutagenicity) , (Reproductive toxicity) , (Specific target organ toxicity (single exposure)) , (Specific target organ toxicity (repeat exposure)) , (Bioaccumulation) , (Biodegradation)
SAMSUNG Total Co., Ltd. MSDS (Description) , (Color) , (Odor) , (Initial boiling point and boiling range) , (Flash point) , (Solubility (ies)) , (Viscosity) , (Incompatible materials)
TOMES-LOLI®; <http://www.rightanswerknowledge.com/loginRA.asp>
UN Recommendations on the transport of dangerous goods 17th
Waste Control Act enforcement regulation attached [1]
American Conference of Governmental Industrial Hygienists TLVs and BEIs.
EU CLP; <http://esis.jrc.ec.europa.eu/index.php?PGM=cla>
IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; <http://monographs.iarc.fr>
Korea Occupational Health & Safety Agency; <http://www.kosha.net>
Momentive Performance materials MSDS (Initial boiling point and boiling range) , (Vapor pressure) , (Solubility (ies)) , (Vapor density)
Momentive Performance materials MSDS (Odor) , (Oral) , (Dermal) , (Inhalation) , (Skin corrosion/ irritation) , (Serious eye damage/ irritation) , (Skin sensitization) , (Mutagenicity)
NIOSH Pocket Guide; <http://www.cdc.gov/niosh/npg/npgdcas.html>
National Chemicals Information System; <http://ncis.nier.go.kr/ncis/>
National Emergency Management Agency-Korea dangerous material inventory management system;
<http://www.nema.go.kr/hazmat/main/main.jsp>
National Toxicology Program; http://ntp-apps.niehs.nih.gov/ntp_tox/index.cfm
TOMES-LOLI®; <http://www.rightanswerknowledge.com/loginRA.asp>
The Chemical Database -The Department of Chemistry at the University of Akron;
<http://ull.chemistry.uakron.edu/erd/> (Description) , (Color) , (Melting point/freezing point) , (Flash point) , (Specific gravity) , (Auto ignition temperature) , (Decomposition temperature)
Waste Control Act enforcement regulation attached [1]
American Conference of Governmental Industrial Hygienists TLVs and BEIs.
EU CLP; <http://esis.jrc.ec.europa.eu/index.php?PGM=cla>
Emergency Response Guidebook 2008;
http://phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/erg2008_eng.pdf
IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; <http://monographs.iarc.fr>
Korea Occupational Health & Safety Agency; <http://www.kosha.net>
NIOSH Pocket Guide; <http://www.cdc.gov/niosh/npg/npgdcas.html>
National Chemicals Information System; <http://ncis.nier.go.kr/ncis/>
National Emergency Management Agency-Korea dangerous material inventory management system;
<http://www.nema.go.kr/hazmat/main/main.jsp>
National Toxicology Program; http://ntp-apps.niehs.nih.gov/ntp_tox/index.cfm

REACH information on registered substances; <http://apps.echa.europa.eu/registered/registered-sub.aspx> (Color), (Odor), (Melting point/freezing point), (Initial boiling point and boiling range), (Flash point), (Vapor pressure), (Solubility (ies)), (Specific gravity), (Partition coefficient: n-octanol/water), (Auto ignition temperature), (Viscosity), (Molecular weight), (Oral), (Dermal), (Inhalation), (Skin corrosion/ irritation), (Serious eye damage/ irritation), (Skin sensitization), (Mutagenicity), (Reproductive toxicity), (Specific target organ toxicity (single exposure)), (Specific target organ toxicity (repeat exposure)), (Fish), (crustacean), (Algae), (Mobility in soil)
 REACH information on registered substances; <http://apps.echa.europa.eu/registered/registered-sub.aspx> (Bioaccumulation)

TOMES-LOLI@; <http://www.rightanswerknowledge.com/loginRA.asp>

The Chemical Database -The Department of Chemistry at the University of Akron;
<http://ull.chemistry.uakron.edu/erd/> (Odor threshold), (Flammability (solid, gas)), (Upper/lower flammability or explosive limits), (Vapor density)

U.S. National library of Medicine(NLM) Hazardous Substances Data Bank(HSDB);

<http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB> (pH), (Decomposition temperature)

UN Recommendations on the transport of dangerous goods 17th

Waste Control Act enforcement regulation attached [1]

<http://apps.echa.europa.eu/registered/registered-sub.aspx> (Biodegradation)

Korea Occupational Health & Safety Agency; <http://www.kosha.net>

Lubrizol MSDS (Other), (Description), (Color), (Odor), (pH), (Upper/lower flammability or explosive limits), (Solubility (ies)), (Vapor density), (Specific gravity), (Auto ignition temperature), (Dermal), (Skin corrosion/ irritation), (Serious eye damage/ irritation), (Respiratory sensitization), (Skin sensitization), (Mutagenicity), (Reproductive toxicity), (Specific target organ toxicity (single exposure)), (Specific target organ toxicity (repeat exposure)), (Aspiration Hazard), (Fish), (crustacean), (Bioaccumulation), (Biodegradation), (Other hazardous effect)

National Chemicals Information System; <http://ncis.nier.go.kr/ncis/>

National Emergency Management Agency-Korea dangerous material inventory management system;
<http://www.nema.go.kr/hazmat/main/main.jsp>

Waste Control Act enforcement regulation attached [1]

AKRON; <http://ull.chemistry.uakron.edu/erd/> (Description), (Color), (Melting point/freezing point), (Initial boiling point and boiling range), (Vapor pressure), (Vapor density), (Specific gravity), (Viscosity), (Molecular weight)

American Conference of Governmental Industrial Hygienists TLVs and BEIs.

EU CLP; <http://esis.jrc.ec.europa.eu/index.php?PGM=cla>

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; <http://monographs.iarc.fr>

Korea Occupational Health & Safety Agency; <http://www.kosha.net>

NIOSH Pocket Guide; <http://www.cdc.gov/niosh/npg/npgdcas.html>

National Chemicals Information System; <http://ncis.nier.go.kr/ncis/>

National Emergency Management Agency-Korea dangerous material inventory management system;
<http://www.nema.go.kr/hazmat/main/main.jsp>

National Toxicology Program; http://ntp-apps.niehs.nih.gov/ntp_tox/index.cfm

TOMES-LOLI@; <http://www.rightanswerknowledge.com/loginRA.asp>

Waste Control Act enforcement regulation attached [1]

B. Issuing date Aug 23, 2013

C. Revision number and date

revision number 1

date of the latest revision 2014.07.16

D. Others

- Revised Material Safety Data Sheet based on the amendments made on the Ministry of Employment and Labor Public Notice on Standard for Classification Labeling of Chemical Substance and Material Safety Data Sheet.
- This MSDS is authored in pursuant to the Article 41 of the Occupational Safety and Health Act.
- The content is based on the latest information and knowledge that we currently possess.
- This MSDS was authored to aid buyer, processor or any other third person who handles the chemical of subject in the MSDS; additionally, it does not warrant suitability of the chemical for special purposes or the commercial use of statements that approves the use of it in combination with other chemicals as well as technical or legal liabilities.