



SAFETY DATA SHEET
DDP SPECIALTY ELECTRONIC MATERIALS
US 9, LLC

Product name: MOLYKOTE® 106 Anti-Friction Coating

Issue Date: 02/13/2019

Print Date: 07/03/2020

DDP SPECIALTY ELECTRONIC MATERIALS US 9, LLC encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. IDENTIFICATION

Product name: MOLYKOTE® 106 Anti-Friction Coating

Recommended use of the chemical and restrictions on use

Identified uses: Lubricants and lubricant additives

COMPANY IDENTIFICATION

DDP SPECIALTY ELECTRONIC MATERIALS
US 9, LLC
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Wilmington DE 19805
UNITED STATES

Customer Information Number:

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EMERGENCY TELEPHONE NUMBER

24-Hour Emergency Contact: 1-800-424-9300

Local Emergency Contact: 800-424-9300

2. HAZARDS IDENTIFICATION

Hazard classification

GHS classification in accordance with 29 CFR 1910.1200

Flammable liquids - Category 3

Skin irritation - Category 2

Serious eye damage - Category 1

Skin sensitisation - Category 1

Specific target organ toxicity - single exposure - Category 3

Specific target organ toxicity - repeated exposure - Category 2 - Inhalation

Label elements

Hazard pictograms



Signal word: **DANGER!**

Hazards

- Flammable liquid and vapour.
- Causes skin irritation.
- May cause an allergic skin reaction.
- Causes serious eye damage.
- May cause respiratory irritation.
- May cause drowsiness or dizziness.
- May cause damage to organs (Auditory system) through prolonged or repeated exposure if inhaled.

Precautionary statements

Prevention

- Keep away from heat/sparks/open flames/hot surfaces. No smoking.
- Keep container tightly closed.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ ventilating/ lighting equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
- Do not breathe spray.
- Wash skin thoroughly after handling.
- Use only outdoors or in a well-ventilated area.
- Contaminated work clothing must not be allowed out of the workplace.
- Wear protective gloves/ eye protection/ face protection.

Response

- IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
- IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor. Get medical advice/ attention if you feel unwell.
- If skin irritation or rash occurs: Get medical advice/ attention.
- Take off contaminated clothing and wash before reuse.
- In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.

Storage

- Store in a well-ventilated place. Keep container tightly closed.
- Store in a well-ventilated place. Keep cool.
- Store locked up.

Disposal

- Dispose of contents/ container to an approved waste disposal plant.

Other hazards

Static-accumulating flammable liquid.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature: Inorganic and organic compounds, dispersion

This product is a mixture.

| Component | CASRN | Concentration |
|---|------------|---------------------|
| Butanol | 71-36-3 | >= 17.0 - <= 23.0 % |
| Molybdenum disulfide | 1317-33-5 | >= 17.0 - <= 21.0 % |
| Xylene | 1330-20-7 | >= 14.0 - <= 19.0 % |
| Reaction product: Bisphenol A-(epichlorohydrin); epoxy resin (number average molecular weight 700-1100) | 25068-38-6 | >= 8.0 - <= 10.0 % |
| Graphite | 7782-42-5 | >= 5.0 - <= 7.0 % |
| Ethylbenzene | 100-41-4 | >= 4.0 - <= 6.0 % |
| Methanol | 67-56-1 | >= 0.08 - <= 0.18 % |

4. FIRST AID MEASURES

Description of first aid measures**General advice:**

First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.

Inhalation: Move person to fresh air. If not breathing, give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask, etc). If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

Skin contact: Remove material from skin immediately by washing with soap and plenty of water. Remove contaminated clothing and shoes while washing. Seek medical attention if irritation persists. Wash clothing before reuse. Discard items which cannot be decontaminated, including leather articles such as shoes, belts and watchbands.

Eye contact: Immediately flush eyes with water; remove contact lenses, if present, after the first 5 minutes, then continue flushing eyes for at least 15 minutes. Obtain medical attention without delay,

preferably from an ophthalmologist. Suitable emergency eye wash facility should be immediately available.

Ingestion: No emergency medical treatment necessary.

Most important symptoms and effects, both acute and delayed:

Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), any additional important symptoms and effects are described in Section 11: Toxicology Information.

Indication of any immediate medical attention and special treatment needed

Notes to physician: Maintain adequate ventilation and oxygenation of the patient. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. Skin contact may aggravate preexisting dermatitis.

5. FIREFIGHTING MEASURES

Suitable extinguishing media: Water spray Alcohol-resistant foam Carbon dioxide (CO₂) Dry chemical

Unsuitable extinguishing media: High volume water jet Do not use direct water stream.

Special hazards arising from the substance or mixture

Hazardous combustion products: Carbon oxides Sulphur oxides Chlorine compounds Nitrogen oxides (NO_x) Formaldehyde

Unusual Fire and Explosion Hazards: Flash back possible over considerable distance. Exposure to combustion products may be a hazard to health. Vapours may form explosive mixtures with air.

Advice for firefighters

Fire Fighting Procedures: Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Do not use a solid water stream as it may scatter and spread fire.

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Use water spray to cool unopened containers. Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Remove undamaged containers from fire area if it is safe to do so. Evacuate area.

Special protective equipment for firefighters: In the event of fire, wear self-contained breathing apparatus. Use personal protective equipment.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: Remove all sources of ignition. Use personal protective equipment. Follow safe handling advice and personal protective equipment recommendations.

Environmental precautions: Do not release the product to the aquatic environment above defined regulatory levels. Prevent further leakage or spillage if safe to do so. Prevent spreading over a wide area (e.g. by containment or oil barriers). Retain and dispose of contaminated wash water. Local authorities should be advised if significant spillages cannot be contained.

Methods and materials for containment and cleaning up: Non-sparking tools should be used. Soak up with inert absorbent material. Suppress (knock down) gases/vapours/mists with a water spray jet. Clean up remaining materials from spill with suitable absorbent. Local or national regulations may apply to releases and disposal of this material, as well as those materials and items employed in the cleanup of releases. You will need to determine which regulations are applicable. For large spills, provide diking or other appropriate containment to keep material from spreading. If dyked material can be pumped, Sections 13 and 15 of this SDS provide information regarding certain local or national requirements.

See sections: 7, 8, 11, 12 and 13.

7. HANDLING AND STORAGE

Precautions for safe handling: Do not get on skin or clothing. Do not breathe vapours or spray mist. Do not swallow. Do not get in eyes. Keep container tightly closed. Keep away from heat and sources of ignition. Take precautionary measures against static discharges. Take care to prevent spills, waste and minimize release to the environment. Non-sparking tools should be used. Handle in accordance with good industrial hygiene and safety practice.

Use with local exhaust ventilation. Use only in an area equipped with explosion proof exhaust ventilation. Ensure all equipment is electrically grounded before beginning transfer operations. This material can accumulate static charge due to its inherent physical properties and can therefore cause an electrical ignition source to vapors. In order to prevent a fire hazard, as bonding and grounding may be insufficient to remove static electricity, it is necessary to provide an inert gas purge before beginning transfer operations. Restrict flow velocity in order to reduce the accumulation of static electricity. Ground and bond container and receiving equipment.

Conditions for safe storage: Keep in properly labelled containers. Store locked up. Keep tightly closed. Keep in a cool, well-ventilated place. Store in accordance with the particular national regulations. Keep away from heat and sources of ignition.

Do not store with the following product types: Strong oxidizing agents. Organic peroxides. Flammable solids. Pyrophoric liquids. Pyrophoric solids. Self-heating substances and mixtures. Substances and mixtures, which in contact with water, emit flammable gases. Explosives. Gases. Unsuitable materials for containers: None known.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

If exposure limits exist, they are listed below. If no exposure limits are displayed, then no values are applicable.

| Component | Regulation | Type of listing | Value/Notation |
|----------------------|------------|-----------------|--------------------------------------|
| Butanol | ACGIH | TWA | 20 ppm |
| | OSHA Z-1 | TWA | 300 mg/m ³ 100 ppm |
| | CAL PEL | C | 150 mg/m ³ 50 ppm |
| Molybdenum disulfide | OSHA Z-1 | TWA total dust | 15 mg/m ³ , Molybdenum |

| | | | |
|--------------|----------|------------------------------|-------------------------------------|
| | ACGIH | TWA Inhalable fraction | 10 mg/m3 , Molybdenum |
| | ACGIH | TWA Respirable fraction | 3 mg/m3 , Molybdenum |
| | CAL PEL | PEL Total dust | 10 mg/m3 , Molybdenum |
| | CAL PEL | PEL respirable dust fraction | 3 mg/m3 , Molybdenum |
| Xylene | OSHA Z-1 | TWA | 435 mg/m3 100 ppm |
| | ACGIH | TWA | 100 ppm |
| | ACGIH | STEL | 150 ppm |
| | CAL PEL | STEL | 655 mg/m3 150 ppm |
| | CAL PEL | C | 300 ppm |
| | CAL PEL | PEL | 435 mg/m3 100 ppm |
| Graphite | OSHA Z-3 | TWA Dust | 15 Million particles per cubic foot |
| | OSHA Z-1 | TWA total dust | 15 mg/m3 |
| | OSHA Z-1 | TWA respirable fraction | 5 mg/m3 |
| | ACGIH | TWA Respirable fraction | 2 mg/m3 |
| | CAL PEL | PEL Total dust | 10 mg/m3 |
| | CAL PEL | PEL respirable dust fraction | 5 mg/m3 |
| | CAL PEL | PEL Respirable dust | 2.5 mg/m3 |
| Ethylbenzene | ACGIH | TWA | 20 ppm |
| | OSHA Z-1 | TWA | 435 mg/m3 100 ppm |
| | CAL PEL | PEL | 22 mg/m3 5 ppm |
| | CAL PEL | STEL | 130 mg/m3 30 ppm |
| Methanol | ACGIH | TWA | 200 ppm |
| | ACGIH | TWA | SKIN |
| | ACGIH | STEL | 250 ppm |
| | ACGIH | STEL | SKIN |
| | OSHA Z-1 | TWA | 260 mg/m3 200 ppm |
| | CAL PEL | C | 1,000 ppm |
| | CAL PEL | PEL | 260 mg/m3 200 ppm |
| | CAL PEL | STEL | 325 mg/m3 250 ppm |

Biological occupational exposure limits

| Components | CAS-No. | Control parameters | Biological specimen | Sampling time | Permissible concentration | Basis |
|--------------|-----------|---------------------------------|---------------------|--|---------------------------|-----------|
| Xylene | 1330-20-7 | Methylhippuric acids | Urine | End of shift (As soon as possible after exposure ceases) | 1.5 g/g creatinine | ACGIH BEI |
| Ethylbenzene | 100-41-4 | Sum of mandelic acid and phenyl | Urine | End of shift (As soon as possible) | 0.15 g/g creatinine | ACGIH BEI |

| | | | | | | |
|----------|---------|----------------|-------|--|---------|-----------|
| | | glyoxylic acid | | after exposure ceases) | | |
| Methanol | 67-56-1 | Methanol | Urine | End of shift (As soon as possible after exposure ceases) | 15 mg/l | ACGIH BEI |

Exposure controls

Engineering controls: Use engineering controls to maintain airborne level below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, use only with adequate ventilation. Local exhaust ventilation may be necessary for some operations.

Individual protection measures

Eye/face protection: Use chemical goggles.

Skin protection

Hand protection: Use gloves chemically resistant to this material. Examples of preferred glove barrier materials include: Neoprene. Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Polyvinyl alcohol ("PVA"). Polyvinyl chloride ("PVC" or "vinyl"). Viton. Examples of acceptable glove barrier materials include: Butyl rubber. Natural rubber ("latex"). Nitrile/butadiene rubber ("nitrile" or "NBR"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Other protection: Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task.

Respiratory protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, use an approved respirator. Selection of air-purifying or positive-pressure supplied-air will depend on the specific operation and the potential airborne concentration of the material. For emergency conditions, use an approved positive-pressure self-contained breathing apparatus.

The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

| | |
|-----------------------|-------------------|
| Physical state | liquid |
| Color | grey |
| Odor | solvent-like |
| Odor Threshold | No data available |
| pH | No data available |

| | |
|---|--|
| Melting point/range | No data available |
| Freezing point | No data available |
| Boiling point (760 mmHg) | 64 °C (147 °F) |
| Flash point | Pensky-Martens closed cup 29.5 °C (85.1 °F) |
| Evaporation Rate (Butyl Acetate = 1) | No data available |
| Flammability (solid, gas) | Not applicable |
| Lower explosion limit | No data available |
| Upper explosion limit | No data available |
| Vapor Pressure | No data available |
| Relative Vapor Density (air = 1) | No data available |
| Relative Density (water = 1) | 1.165 |
| Water solubility | No data available |
| Partition coefficient: n-octanol/water | No data available |
| Auto-ignition temperature | No data available |
| Decomposition temperature | No data available |
| Kinematic Viscosity | > 20.5 mm ² /s at 25 °C (77 °F) |
| Explosive properties | Not explosive |
| Oxidizing properties | The substance or mixture is not classified as oxidizing. |
| Molecular weight | No data available |
| Particle size | Not applicable |

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

10. STABILITY AND REACTIVITY

Reactivity: Not classified as a reactivity hazard.

Chemical stability: Stable under normal conditions.

Possibility of hazardous reactions: Can react with strong oxidizing agents. When heated to temperatures above 150 °C (300 °F) in the presence of air, product can form formaldehyde vapours. Safe handling conditions may be maintained by keeping vapour concentrations within the occupational exposure limit for formaldehyde. Vapours may form explosive mixture with air. Flammable liquid and vapour.

Conditions to avoid: Heat, flames and sparks.

Incompatible materials: Oxidizing agents

Hazardous decomposition products: Bisphenol A. Phenol.

11. TOXICOLOGICAL INFORMATION

Toxicological information appears in this section when such data is available.

Acute toxicity

Acute oral toxicity

Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts.

As product: Single dose oral LD50 has not been determined.

Based on information for component(s):

LD50, Rat, > 5,000 mg/kg Estimated.

Acute dermal toxicity

Prolonged skin contact is unlikely to result in absorption of harmful amounts.

As product: The dermal LD50 has not been determined.

Based on information for component(s):

LD50, Rabbit, > 5,000 mg/kg Estimated.

Acute inhalation toxicity

Prolonged excessive exposure may cause adverse effects. May cause respiratory irritation and central nervous system depression. Symptoms of excessive exposure may be anesthetic or narcotic effects; dizziness and drowsiness may be observed.

As product: The LC50 has not been determined.

Skin corrosion/irritation

Brief contact may cause skin irritation with local redness.

Prolonged contact may cause severe skin irritation with local redness and discomfort.

May cause drying and flaking of the skin.

Serious eye damage/eye irritation

May cause severe eye irritation.

May cause moderate corneal injury.

Sensitization

For skin sensitization:

Contains component(s) which have caused allergic skin sensitization in guinea pigs.

For respiratory sensitization:

No relevant data found.

Specific Target Organ Systemic Toxicity (Single Exposure)

Contains component(s) which are classified as specific target organ toxicant, single exposure, category 3.

Specific Target Organ Systemic Toxicity (Repeated Exposure)

Contains component(s) which have been reported to cause effects on the following organs in animals:

Blood.

Kidney.

Liver.

Lung.

May cause hearing loss based on animal data.

Butanol has been reported to cause eye effects (tearing, blurred vision, sensitivity to light, temporary corneal effects), hearing loss and vertigo.

Carcinogenicity

Ethylbenzene has been shown to cause cancer in laboratory animals. There is no evidence that these findings are relevant to humans.

Teratogenicity

Contains component(s) which caused birth defects in laboratory animals only at doses toxic to the mother. Contains component(s) which, in laboratory animals, have been toxic to the fetus at doses nontoxic to the mother.

Reproductive toxicity

Contains component(s) which did not interfere with reproduction in animal studies.

Mutagenicity

Contains a component(s) which were negative in in vitro genetic toxicity studies. Contains component(s) which were negative in animal genetic toxicity studies.

Aspiration Hazard

Based on physical properties, not likely to be an aspiration hazard.

COMPONENTS INFLUENCING TOXICOLOGY:**Butanol****Acute inhalation toxicity**

LC50, Rat, male and female, 4 Hour, vapour, > 17.76 mg/l OECD Test Guideline 403 No deaths occurred at this concentration.

Molybdenum disulfide**Acute inhalation toxicity**

LC50, Rat, 4 Hour, dust/mist, > 2.82 mg/l No deaths occurred at this concentration.

Xylene**Acute inhalation toxicity**

LC50, Rat, 4 Hour, vapour, 27.5 mg/l

Reaction product: Bisphenol A-(epichlorohydrin); epoxy resin (number average molecular weight 700-1100)**Acute inhalation toxicity**

The LC50 has not been determined.

Graphite**Acute inhalation toxicity**

LC50, Rat, 4 Hour, dust/mist, > 2 mg/l OECD Test Guideline 403 No deaths occurred at this concentration.

Ethylbenzene**Acute inhalation toxicity**

LC50, Rat, 4 Hour, vapour, 17.2 mg/l

Methanol**Acute inhalation toxicity**

Easily attainable vapor concentrations may cause serious adverse effects, even death. At lower concentrations: May cause respiratory irritation and central nervous system depression. Symptoms may include headache, dizziness and drowsiness, progressing to incoordination and unconsciousness. Inhalation of methanol may cause effects ranging from headache, narcosis and visual impairment to metabolic acidosis, blindness, and even death. Effects may be delayed.

LC50, Rat, 4 Hour, vapour, 3 mg/l

Carcinogenicity

Component

Ethylbenzene

List

IARC

ACGIH

Classification

Group 2B: Possibly carcinogenic to humans

A3: Confirmed animal carcinogen with unknown relevance to humans.

12. ECOLOGICAL INFORMATION

Ecotoxicological information appears in this section when such data is available.

Toxicity

Butanol

Acute toxicity to fish

Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).

LC50, Pimephales promelas (fathead minnow), flow-through test, 96 Hour, 1,376 mg/l, OECD Test Guideline 203 or Equivalent

Acute toxicity to aquatic invertebrates

EC50, Daphnia magna (Water flea), static test, 48 Hour, 1,328 mg/l, OECD Test Guideline 202 or Equivalent

Acute toxicity to algae/aquatic plants

EC50, Pseudokirchneriella subcapitata (green algae), 96 Hour, Growth rate inhibition, 225 mg/l, OECD Test Guideline 201 or Equivalent

Toxicity to bacteria

EC50, Pseudomonas putida, static test, 17 Hour, Growth inhibition, > 1,000 mg/l, DIN 38412

Chronic toxicity to aquatic invertebrates

NOEC, Daphnia magna (Water flea), semi-static test, 21 d, number of offspring, 4.1 mg/l

Toxicity to Above Ground Organisms

Material is practically non-toxic to birds on an acute basis (LD50 > 2000 mg/kg).

Molybdenum disulfide

Acute toxicity to fish

Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).

For similar material(s):

LC50, Fish, 96 Hour, > 100 mg/l

Acute toxicity to aquatic invertebrates

Based on data from similar materials
EC50, Daphnia magna (Water flea), 48 Hour, > 100 mg/l

Acute toxicity to algae/aquatic plants

Based on data from similar materials
ErC50, algae, 72 Hour, Growth rate, > 100 mg/l

Toxicity to bacteria

EC50, 30 Hour, Respiration rates., > 100 mg/l

Chronic toxicity to fish

Based on data from similar materials
NOEC, Fish, 34 d, > 10 mg/l

Chronic toxicity to aquatic invertebrates

Based on data from similar materials
NOEC, Daphnia magna, 21 d, > 10 mg/l

Xylene

Acute toxicity to fish

Material is moderately toxic to aquatic organisms on an acute basis (LC50/EC50 between 1 and 10 mg/L in the most sensitive species tested).
LC50, Oncorhynchus mykiss (rainbow trout), semi-static test, 96 Hour, 2.6 mg/l, OECD Test Guideline 203 or Equivalent

Acute toxicity to aquatic invertebrates

IC50, Daphnia magna (Water flea), 24 Hour, 1 - 4.7 mg/l, OECD Test Guideline 202 or Equivalent

Acute toxicity to algae/aquatic plants

ErC50, Pseudokirchneriella subcapitata (algae), Static, 73 Hour, Growth rate, 4.36 mg/l, OECD Test Guideline 201 or Equivalent
NOEC, Pseudokirchneriella subcapitata (green algae), 73 Hour, Growth rate, 0.44 mg/l, OECD Test Guideline 201 or Equivalent

Chronic toxicity to fish

NOEC, Oncorhynchus mykiss (rainbow trout), flow-through, 56 d, mortality, > 1.3 mg/l

Reaction product: Bisphenol A-(epichlorohydrin); epoxy resin (number average molecular weight 700-1100)

Acute toxicity to fish

Based on information for a similar material:
Not expected to be acutely toxic, but may cause adverse effects by physical/mechanical means.

Graphite

Acute toxicity to fish

Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).
LC50, Danio rerio (zebra fish), 96 Hour, > 100 mg/l, OECD Test Guideline 203

Acute toxicity to aquatic invertebrates

EC50, Daphnia magna (Water flea), 48 Hour, > 100 mg/l, OECD Test Guideline 202

Acute toxicity to algae/aquatic plants

EC50, Pseudokirchneriella subcapitata (green algae), 72 Hour, > 100 mg/l, OECD Test Guideline 201

Toxicity to bacteria

EC50, 3 Hour, > 1,012.5 mg/l, OECD Test Guideline 209

Ethylbenzene

Acute toxicity to fish

Material is moderately toxic to aquatic organisms on an acute basis (LC50/EC50 between 1 and 10 mg/L in the most sensitive species tested).

LC50, Oncorhynchus mykiss (rainbow trout), semi-static test, 96 Hour, 4.2 mg/l, OECD Test Guideline 203 or Equivalent

Acute toxicity to aquatic invertebrates

EC50, Daphnia magna (Water flea), Static, 48 Hour, 1.8 - 2.4 mg/l

Acute toxicity to algae/aquatic plants

EC50, Pseudokirchneriella subcapitata (green algae), 72 Hour, Growth inhibition (cell density reduction), 3.6 - 4.6 mg/l, OECD Test Guideline 201 or Equivalent

Toxicity to bacteria

EC50, Bacteria, 16 Hour, > 12 mg/l

Chronic toxicity to aquatic invertebrates

NOEC, Ceriodaphnia dubia (water flea), semi-static test, 7 d, 0.96 mg/l

Toxicity to soil-dwelling organisms

LC50, Eisenia fetida (earthworms), 2 d, survival, 0.047 mg/cm²

Methanol

Acute toxicity to fish

Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).

LC50, Bluegill sunfish (Lepomis macrochirus), flow-through test, 96 Hour, 15,400 mg/l

Acute toxicity to aquatic invertebrates

LC50, Daphnia magna (Water flea), 48 Hour, > 10,000 mg/l

Acute toxicity to algae/aquatic plants

ErC50, Pseudokirchneriella subcapitata (green algae), 96 Hour, Growth rate, 22,000 mg/l, OECD Test Guideline 201 or Equivalent

Toxicity to bacteria

IC50, activated sludge, 3 Hour, Respiration rates., > 1,000 mg/l, OECD Test Guideline 209

Chronic toxicity to fish

NOEC, Oryzias latipes (Orange-red killifish), 200 Hour, 15,800 mg/l

Persistence and degradability

Butanol

Biodegradability: Material is readily biodegradable. Passes OECD test(s) for ready biodegradability.

10-day Window: Pass

Biodegradation: 98 %

Exposure time: 19 d

Method: OECD Test Guideline 301E or Equivalent

Theoretical Oxygen Demand: 2.59 mg/mg Estimated.

Chemical Oxygen Demand: 2.45 mg/mg Estimated.

Photodegradation

Test Type: Half-life (indirect photolysis)

Sensitization: OH radicals

Atmospheric half-life: 55.9 Hour

Method: Estimated.

Molybdenum disulfide

Biodegradability: Biodegradability is not applicable to inorganic substances.

Xylene

Biodegradability: Material is expected to be readily biodegradable.

10-day Window: Pass

Biodegradation: > 60 %

Exposure time: 10 d

Method: OECD Test Guideline 301F or Equivalent

Theoretical Oxygen Demand: 3.17 mg/mg

Biological oxygen demand (BOD)

| Incubation Time | BOD |
|------------------------|------------|
| 5 d | 37.000 % |
| 10 d | 58.000 % |
| 20 d | 72.000 % |

Photodegradation

Test Type: Half-life (indirect photolysis)

Sensitization: OH radicals

Atmospheric half-life: 19.7 Hour

Method: Estimated.

Reaction product: Bisphenol A-(epichlorohydrin); epoxy resin (number average molecular weight 700-1100)

Biodegradability: This water-insoluble polymeric solid is expected to be inert in the environment. Surface photodegradation is expected with exposure to sunlight. No appreciable biodegradation is expected.

Graphite

Biodegradability: Biodegradation is not applicable.

Ethylbenzene

Biodegradability: Material is readily biodegradable. Passes OECD test(s) for ready biodegradability.

10-day Window: Pass

Biodegradation: 100 %

Exposure time: 6 d

Method: OECD Test Guideline 301E or Equivalent

Theoretical Oxygen Demand: 3.17 mg/mg Estimated.

Chemical Oxygen Demand: 2.62 mg/mg Dichromate

Biological oxygen demand (BOD)

| Incubation Time | BOD |
|-----------------|--------|
| 5 d | 31.5 % |
| 10 d | 38.5 % |
| 20 d | 45.4 % |

Photodegradation

Sensitization: OH radicals

Atmospheric half-life: 55 Hour

Method: Estimated.

Methanol

Biodegradability: Material is readily biodegradable. Passes OECD test(s) for ready biodegradability.

Theoretical Oxygen Demand: 1.50 mg/mg

Chemical Oxygen Demand: 1.49 mg/mg Dichromate

Biological oxygen demand (BOD)

| Incubation Time | BOD |
|-----------------|------|
| 5 d | 72 % |
| 20 d | 79 % |

Photodegradation

Test Type: Half-life (indirect photolysis)

Sensitization: OH radicals

Atmospheric half-life: 8 - 18 d

Method: Estimated.

Bioaccumulative potential

Butanol

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient: n-octanol/water(log Pow): 1 at 25 °C OECD Guideline 117 (Partition Coefficient (n-octanol / water), HPLC Method)
Bioconcentration factor (BCF): 3.16 Fish Estimated.

Molybdenum disulfide

Bioaccumulation: Partitioning from water to n-octanol is not applicable.

Xylene

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient: n-octanol/water(log Pow): 3.12 Measured
Bioconcentration factor (BCF): 25.9 Rainbow trout (Salmo gairdneri) Measured

Reaction product: Bisphenol A-(epichlorohydrin); epoxy resin (number average molecular weight 700-1100)

Bioaccumulation: No relevant data found.

Graphite

Bioaccumulation: No relevant data found.

Ethylbenzene

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient: n-octanol/water(log Pow): 3.15 Measured
Bioconcentration factor (BCF): 15 Fish Measured

Methanol

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient: n-octanol/water(log Pow): -0.77 Measured
Bioconcentration factor (BCF): < 10 Leuciscus idus (Golden orfe) Measured

Mobility in soil

Butanol

Potential for mobility in soil is very high (Koc between 0 and 50).
Partition coefficient (Koc): 2.4 Estimated.

Molybdenum disulfide

No relevant data found.

Xylene

Potential for mobility in soil is medium (Koc between 150 and 500).
Partition coefficient (Koc): 443 Estimated.

Reaction product: Bisphenol A-(epichlorohydrin); epoxy resin (number average molecular weight 700-1100)

In the terrestrial environment, material is expected to remain in the soil.
In the aquatic environment, material will sink and remain in the sediment.

Graphite

No relevant data found.

Ethylbenzene

Potential for mobility in soil is low (Koc between 500 and 2000).
Partition coefficient (Koc): 518 Estimated.

Methanol

Potential for mobility in soil is very high (Koc between 0 and 50).

Partition coefficient (Koc): 0.44 Estimated.

13. DISPOSAL CONSIDERATIONS

Disposal methods: DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. AS YOUR SUPPLIER, WE HAVE NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Incinerator or other thermal destruction device. For additional information, refer to: Handling & Storage Information, MSDS Section 7 Stability & Reactivity Information, MSDS Section 10 Regulatory Information, MSDS Section 15

Treatment and disposal methods of used packaging: Empty containers should be recycled or otherwise disposed of by an approved waste management facility. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. Do not re-use containers for any purpose.

14. TRANSPORT INFORMATION

DOT

| | |
|-----------------------------|---|
| Proper shipping name | Flammable liquids, n.o.s.(Ethylbenzene, Butan-1-ol) |
| UN number | UN 1993 |
| Class | 3 |
| Packing group | III |
| Reportable Quantity | Xylene, Ethylbenzene |

Classification for SEA transport (IMO-IMDG):

| | |
|---|--|
| Proper shipping name | FLAMMABLE LIQUID, N.O.S.(Ethylbenzene, Butan-1-ol) |
| UN number | UN 1993 |
| Class | 3 |
| Packing group | III |
| Marine pollutant | No |
| Transport in bulk according to Annex I or II of MARPOL 73/78 and the IBC or IGC Code | Consult IMO regulations before transporting ocean bulk |

Classification for AIR transport (IATA/ICAO):

| | |
|-----------------------------|--|
| Proper shipping name | Flammable liquid, n.o.s.(Ethylbenzene, Butan-1-ol) |
| UN number | UN 1993 |
| Class | 3 |

Packing group

III

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. REGULATORY INFORMATION

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312

Flammable (gases, aerosols, liquids, or solids)
 Hazard not otherwise classified (physical hazards)
 Skin corrosion or irritation
 Serious eye damage or eye irritation
 Respiratory or skin sensitisation
 Specific target organ toxicity (single or repeated exposure)

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313

The following components are subject to reporting levels established by SARA Title III, Section 313:

| Components | CASRN |
|--------------|-----------|
| Butanol | 71-36-3 |
| Xylene | 1330-20-7 |
| Ethylbenzene | 100-41-4 |

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) Section 103

| Components | CASRN | RQ (RCRA Code) |
|--------------|-----------|-------------------|
| Xylene | 1330-20-7 | 100 lbs RQ |
| Xylene | 1330-20-7 | 100 lbs RQ (F003) |
| Butanol | 71-36-3 | 5000 lbs RQ |
| Butanol | 71-36-3 | 100 lbs RQ (F003) |
| Xylene | 1330-20-7 | 100 lbs RQ |
| Xylene | 1330-20-7 | 100 lbs RQ (F003) |
| Ethylbenzene | 100-41-4 | 1000 lbs RQ |
| Ethylbenzene | 100-41-4 | 100 lbs RQ (F003) |
| Methanol | 67-56-1 | 5000 lbs RQ |
| Methanol | 67-56-1 | 100 lbs RQ (F003) |

Pennsylvania Right To Know

The following chemicals are listed because of the additional requirements of Pennsylvania law:

| Components | CASRN |
|------------------------------|------------|
| Butanol | 71-36-3 |
| Ethoxy-1-methylethyl acetate | 54839-24-6 |
| Molybdenum disulfide | 1317-33-5 |

| | |
|--|---------------|
| Xylene | 1330-20-7 |
| Reaction product: Bisphenol A-(epichlorohydrin); epoxy resin (number average molecular weight 700-1100) | 25068-38-6 |
| Graphite | 7782-42-5 |
| Ethylbenzene | 100-41-4 |
| Urea-Formaldehyde Resin Butyl Ether | Not available |
| Formaldehyde | 50-00-0 |

California Prop. 65

WARNING: This product can expose you to chemicals including Ethylbenzene, Formaldehyde, which is/are known to the State of California to cause cancer, and Methanol, which is/are known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

United States TSCA Inventory (TSCA)

All components of this product are in compliance with the inventory listing requirements of the U.S. Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

16. OTHER INFORMATION

Hazard Rating System**NFPA**

| Health | Flammability | Instability |
|--------|--------------|-------------|
| 3 | 3 | 0 |

HMIS

| Health | Flammability | Physical Hazard |
|--------|--------------|-----------------|
| 3* | 3 | 0 |

* = Chronic Effects (See Hazards Identification)

Revision

Identification Number: 4113738 / A776 / Issue Date: 02/13/2019 / Version: 8.0

Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

| | |
|-----------|---|
| ACGIH | USA. ACGIH Threshold Limit Values (TLV) |
| ACGIH BEI | ACGIH - Biological Exposure Indices (BEI) |
| C | Ceiling |
| CAL PEL | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
| OSHA Z-1 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| OSHA Z-3 | USA. Occupational Exposure Limits (OSHA) - Table Z-3 Mineral Dusts |
| PEL | Permissible exposure limit |
| SKIN | Absorbed via skin |
| STEL | Short-term exposure limit |
| TWA | 8-hour time weighted average |

Full text of other abbreviations

AICS - Australian Inventory of Chemical Substances; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; HMIS - Hazardous Materials Identification System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; MSHA - Mine Safety and Health Administration; n.o.s. - Not Otherwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

Information Source and References

This SDS is prepared by Product Regulatory Services and Hazard Communications Groups from information supplied by internal references within our company.

DDP SPECIALTY ELECTRONIC MATERIALS US 9, LLC urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

US

