



SAFETY DATA SHEET

DDP SPECIALTY ELECTRONIC MATERIALS US,
INC.

Product name: MOLYKOTE™ D-321 R Anti-Friction Coating
Spray

Issue Date: 10/16/2018

Print Date: 06/14/2019

DDP SPECIALTY ELECTRONIC MATERIALS US, INC. 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™ D-321 R Anti-Friction Coating Spray

Recommended use of the chemical and restrictions on use

Identified uses: Lubricants and lubricant additives

COMPANY IDENTIFICATION

DDP SPECIALTY ELECTRONIC MATERIALS US,
INC.

400 ARCOLA ROAD
COLLEGEVILLE PA 19426-2914
UNITED STATES

Customer Information Number:

833-338-7668
SDSQuestion-NA@dupont.com

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 aerosols - Category 1

Gases under pressure - Dissolved gas

Specific target organ toxicity - single exposure - Category 3

Specific target organ toxicity - repeated exposure - Category 1

Label elements

Hazard pictograms



Signal word: **DANGER!**

Hazards

Extremely flammable aerosol.

Contains gas under pressure; may explode if heated.

May cause drowsiness or dizziness.

Causes damage to organs (Central nervous system) through prolonged or repeated exposure.

Precautionary statements

Prevention

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

Do not spray on an open flame or other ignition source.

Pressurized container: Do not pierce or burn, even after use.

Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.

Wash skin thoroughly after handling.

Do not eat, drink or smoke when using this product.

Use only outdoors or in a well-ventilated area.

Response

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.

Get medical advice/ attention if you feel unwell.

Storage

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

Store locked up.

Protect from sunlight. Do not expose to temperatures exceeding 50 °C/ 122 °F.

Disposal

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

Other hazards

No data available

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature: Molybdenum disulfide, aerosol

This product is a mixture.

Component	CASRN	Concentration
Butane (containing < 0.1% butadiene))	106-97-8	>= 49.0 - <= 67.0 %

n-Butyl Acetate	123-86-4	>= 8.0 - <= 12.0 %
Propane	74-98-6	>= 8.0 - <= 12.0 %
Naphtha (petroleum), hydrodesulfurized heavy	64742-82-1	>= 7.0 - <= 11.0 %
Molybdenum disulfide	1317-33-5	>= 5.0 - <= 7.0 %
Polybutyl titanate	9022-96-2	>= 3.0 - <= 4.0 %
Graphite	7782-42-5	>= 1.4 - <= 1.8 %
Ethylbenzene	100-41-4	>= 0.12 - <= 0.16 %

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: Wash off with plenty of water.

Eye contact: Flush eyes thoroughly with water for several minutes. Remove contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.

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. May cause asthma-like (reactive airways) symptoms. Bronchodilators, expectorants, antitussives and corticosteroids may be of help. Exposure may increase "myocardial irritability". Do not administer sympathomimetic drugs such as epinephrine unless absolutely necessary. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. Repeated excessive exposure may aggravate preexisting lung disease.

5. FIREFIGHTING MEASURES

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

Unsuitable extinguishing media: Do not use direct water stream.

Special hazards arising from the substance or mixture

Hazardous combustion products: Carbon oxides Sulphur oxides

Unusual Fire and Explosion Hazards: Flash back possible over considerable distance. May form explosive mixtures in air. Exposure to combustion products may be a hazard to health. If the temperature rises there is danger of the vessels bursting due to the high vapor pressure. 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. EXPLOSION HAZARD. Fight advanced fires from a protected location. 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. Fight fire remotely due to the risk of explosion. 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 absorbant. 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 dyking 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 breathe vapours or spray mist. Do not swallow. Avoid contact with eyes. Avoid prolonged or repeated contact with skin. 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. Close valve after each use and when empty. Do NOT change or force fit connections. Open the valves slowly to prevent pressure surges. Handle in accordance with good industrial hygiene and safety practice. Do not spray on an open flame or other ignition source.

Use with local exhaust ventilation. Use only in an area equipped with explosion proof exhaust ventilation. See Engineering measures under EXPOSURE CONTROLS/PERSONAL PROTECTION section.

Conditions for safe storage: Store locked up. Keep tightly closed. Keep in a cool, well-ventilated place. Keep away from direct sunlight. Store in accordance with the particular national regulations. Do not pierce or burn, even after use. Keep cool. Protect from sunlight.

Do not store with the following product types: Oxidizing agents. Self-reactive substances and mixtures. 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.

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
Butane (containing < 0.1% butadiene))	ACGIH	STEL	1,000 ppm
n-Butyl Acetate	Dow IHG	TWA	75 ppm
	Dow IHG	STEL	150 ppm
	OSHA Z-1	TWA	710 mg/m3 150 ppm
	ACGIH	TWA	50 ppm
	ACGIH	STEL	150 ppm
Propane	ACGIH		Asphyxiant
	OSHA Z-1	TWA	1,800 mg/m3 1,000 ppm
	CAL PEL	PEL	1,800 mg/m3 1,000 ppm
Naphtha (petroleum), hydrodesulfurized heavy	OSHA Z-1	TWA	2,000 mg/m3 500 ppm
	OSHA P0	TWA	1,600 mg/m3 400 ppm
Molybdenum disulfide	OSHA Z-1	TWA total dust	15 mg/m3 , Molybdenum
	ACGIH	TWA Inhalable fraction	10 mg/m3 , Molybdenum
	ACGIH	TWA Respirable fraction	3 mg/m3 , Molybdenum

Graphite	CAL PEL	PEL Total dust	10 mg/m ³ , Molybdenum
	CAL PEL	PEL respirable dust fraction	3 mg/m ³ , Molybdenum
	OSHA Z-3	TWA Dust	15 Million particles per cubic foot
	OSHA Z-1	TWA total dust	15 mg/m ³
	OSHA Z-1	TWA respirable fraction	5 mg/m ³
	ACGIH	TWA Respirable fraction	2 mg/m ³
Ethylbenzene	ACGIH	TWA	20 ppm
	OSHA Z-1	TWA	435 mg/m ³ 100 ppm

This material contains a simple asphyxiant which may displace oxygen. Insure adequate ventilation to prevent an oxygen deficient atmosphere.

The following substance(s), which have Occupational Exposure Limit(s) (OEL), may be formed during handling or processing:
butanol

Biological occupational exposure limits

Components	CAS-No.	Control parameters	Biological specimen	Sampling time	Permissible concentration	Basis
Ethylbenzene	100-41-4	Sum of mandelic acid and phenyl glyoxylic acid	Urine	End of shift (As soon as possible after exposure ceases)	0.15 g/g creatinine	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 in enclosed systems or with local exhaust ventilation. Exhaust systems should be designed to move the air away from the source of vapor/aerosol generation and people working at this point. Lethal concentrations may exist in areas with poor ventilation.

Individual protection measures

Eye/face protection: Use safety glasses (with side shields). If exposure causes eye discomfort, use a full-face respirator.

Skin protection

Hand protection: Use gloves chemically resistant to this material when prolonged or frequently repeated contact could occur. Examples of preferred glove barrier materials include: Chlorinated polyethylene. Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Polyvinyl alcohol ("PVA"). Viton. Examples of acceptable glove barrier materials include: Butyl rubber. Natural rubber ("latex"). Polyvinyl chloride ("PVC" or "vinyl"). 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: Wear clean, body-covering clothing.

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. When respiratory protection is required, use an approved positive-pressure self-contained breathing apparatus or positive-pressure airline with auxiliary self-contained air supply. For emergency conditions, use an approved positive-pressure self-contained breathing apparatus. In confined or poorly ventilated areas, use an approved self-contained breathing apparatus or positive pressure air line with auxiliary self-contained air supply.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Physical state	Aerosol containing a dissolved gas
Color	black
Odor	solvent-like
Odor Threshold	No data available
pH	Not applicable
Melting point/range	No data available
Freezing point	No data available
Boiling point (760 mmHg)	Not applicable
Flash point	Not applicable
Evaporation Rate (Butyl Acetate = 1)	Not applicable
Flammability (solid, gas)	Extremely flammable aerosol.
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)	1.05
Water solubility	No data available
Partition coefficient: n-octanol/water	No data available
Auto-ignition temperature	No data available
Decomposition temperature	No data available
Dynamic Viscosity	Not applicable
Kinematic Viscosity	Not applicable
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. If the temperature rises there is danger of the vessels bursting due to the high vapor pressure. Vapours may form explosive mixture with air. Extremely flammable aerosol.

Conditions to avoid: Heat, flames and sparks.

Incompatible materials: Oxidizing agents

Hazardous decomposition products: Butanol.

11. TOXICOLOGICAL INFORMATION

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

Acute toxicity

Acute oral toxicity

No hazard from gas. Swallowing is unlikely because of the physical state.

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, > 2,000 mg/kg Estimated.

Acute inhalation toxicity

In confined or poorly ventilated areas, vapor can easily accumulate and can cause unconsciousness and death due to displacement of oxygen. Symptoms of excessive exposure may be anesthetic or narcotic effects; dizziness and drowsiness may be observed. Excessive exposure may increase sensitivity to epinephrine and increase myocardial irritability (irregular heartbeats). Excessive exposure may cause irritation to upper respiratory tract (nose and throat) and lungs.

As product: The LC50 has not been determined.

Skin corrosion/irritation

Brief contact is essentially nonirritating to skin.

Prolonged contact may cause skin irritation with local redness.

Serious eye damage/eye irritation

May cause slight eye irritation.

Corneal injury is unlikely.

Vapor may cause eye irritation experienced as mild discomfort and redness.

Sensitization

Based on information for component(s):

For skin sensitization:

No relevant data found.

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)

Product test data not available. Refer to component data.

Carcinogenicity

Ethylbenzene has been shown to cause cancer in laboratory animals.

Teratogenicity

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

Reproductive toxicity

No relevant data found.

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:**Butane (containing < 0.1% butadiene)****Acute inhalation toxicity**

LC50, Rat, 4 Hour, vapour, 658 mg/l

Specific Target Organ Systemic Toxicity (Repeated Exposure)

Based on available data, repeated exposures are not anticipated to cause additional significant adverse effects.

n-Butyl Acetate

Acute inhalation toxicity

The LC50 has not been determined.

Specific Target Organ Systemic Toxicity (Repeated Exposure)

In animals, effects have been reported on the following organs:
Nasal tissue.

Propane

Acute inhalation toxicity

LC50, Rat, male and female, 4 Hour, vapour, > 425000 ppm

Specific Target Organ Systemic Toxicity (Repeated Exposure)

Based on available data, repeated exposures are not anticipated to cause additional significant adverse effects.

Naphtha (petroleum), hydrodesulfurized heavy

Acute inhalation toxicity

Based on data from similar materials LC50, Rat, 4 Hour, vapour, > 13.1 mg/l

Specific Target Organ Systemic Toxicity (Repeated Exposure)

For similar material(s):
In humans, effects have been reported on the following organs:
Central nervous system.

Molybdenum disulfide

Acute inhalation toxicity

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

Specific Target Organ Systemic Toxicity (Repeated Exposure)

No relevant data found.

Polybutyl titanate

Acute inhalation toxicity

The LC50 has not been determined.

Specific Target Organ Systemic Toxicity (Repeated Exposure)

No relevant data found.

Graphite

Acute inhalation toxicity

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

Specific Target Organ Systemic Toxicity (Repeated Exposure)

Excessive exposure may cause irritation to upper respiratory tract (nose and throat) and lungs.

Ethylbenzene

Acute inhalation toxicity

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

Specific Target Organ Systemic Toxicity (Repeated Exposure)

In animals, effects have been reported on the following organs:
May cause hearing loss based on animal data.

Kidney.

Liver.

Lung.

Although one early inhalation study on ethylbenzene reported an adverse effect on the testes, recent, more comprehensive studies have not shown this effect.

Carcinogenicity

Component

List

Classification

Naphtha (petroleum),
hydrodesulfurized heavy

IARC

Group 2B: Possibly carcinogenic to
humans

Ethylbenzene

IARC

Group 2B: Possibly carcinogenic to
humans

ACGIH

A3: Confirmed animal carcinogen with
unknown relevance to humans.

12. ECOLOGICAL INFORMATION

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

Toxicity

Butane (containing < 0.1% butadiene))

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).

n-Butyl Acetate

Acute toxicity to fish

Material is slightly toxic to aquatic organisms on an acute basis (LC50/EC50 between 10 and 100 mg/L in the most sensitive species tested).

LC50, Pimephales promelas (fathead minnow), flow-through test, 96 Hour, 18 mg/l

Acute toxicity to aquatic invertebrates

LC50, Daphnia magna (Water flea), 48 Hour, 44 mg/l

Acute toxicity to algae/aquatic plants

ErC50, Desmodesmus subspicatus (green algae), 72 Hour, Growth rate inhibition, 648 mg/l

Toxicity to bacteria

EC50, Bacteria, 16 Hour, > 1,000 mg/l

Chronic toxicity to aquatic invertebrates

NOEC, Daphnia magna (Water flea), 21 d, 23 mg/l

Propane

Acute toxicity to fish

No relevant data found.

Naphtha (petroleum), hydrodesulfurized heavy

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).

Based on data from similar materials

LL50, Oncorhynchus mykiss (rainbow trout), 96 Hour, 10 - 30 mg/l, OECD Test Guideline 203

Acute toxicity to aquatic invertebrates

Based on data from similar materials

EL50, Daphnia magna (Water flea), 48 Hour, 10 - 22 mg/l, OECD Test Guideline 202

Acute toxicity to algae/aquatic plants

Based on data from similar materials

EL50, Pseudokirchneriella subcapitata (green algae), 72 Hour, 4.6 - 10 mg/l, OECD Test Guideline 201

Based on data from similar materials

NOELR, Pseudokirchneriella subcapitata (green algae), 72 Hour, 0.22 mg/l, OECD Test Guideline 201

Chronic toxicity to aquatic invertebrates

Based on data from similar materials

NOELR, Daphnia magna (Water flea), 21 d, 0.097 mg/l

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

Polybutyl titanate

Acute toxicity to fish

Not expected to be acutely toxic to aquatic organisms.

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

Persistence and degradability**Butane (containing < 0.1% butadiene)**

Biodegradability: Material is expected to be readily biodegradable.

Theoretical Oxygen Demand: 3.58 mg/mg

Photodegradation

Test Type: Half-life (indirect photolysis)

Sensitization: OH radicals

Atmospheric half-life: 49 Hour

Method: Estimated.

n-Butyl Acetate

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

10-day Window: Pass

Biodegradation: 83 %

Exposure time: 28 d

Method: OECD Test Guideline 301D or Equivalent

Theoretical Oxygen Demand: 2.20 mg/mg Estimated.

Photodegradation

Sensitization: OH radicals

Atmospheric half-life: 2.32 d

Method: Estimated.

Propane

Biodegradability: No relevant data found.

Theoretical Oxygen Demand: 3.64 mg/mg

Photodegradation

Test Type: Half-life (indirect photolysis)

Sensitization: OH radicals

Atmospheric half-life: 8.4 d

Method: Estimated.

Naphtha (petroleum), hydrodesulfurized heavy

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

Based on data from similar materials 10-day Window: Pass

Biodegradation: 74.7 %

Exposure time: 28 d

Method: OECD Test Guideline 301F

Molybdenum disulfide

Biodegradability: Biodegradability is not applicable to inorganic substances.

Polybutyl titanate

Biodegradability: Biodegradability is not applicable to inorganic substances.

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.**Bioaccumulative potential****Butane (containing < 0.1% butadiene)****Bioaccumulation:** Bioconcentration potential is low (BCF < 100 or Log Pow < 3).**Partition coefficient: n-octanol/water(log Pow):** 2.89 Measured**n-Butyl Acetate****Bioaccumulation:** Bioconcentration potential is low (BCF < 100 or Log Pow < 3).**Partition coefficient: n-octanol/water(log Pow):** Pow: 3.2 at 25 °C Measured**Bioconcentration factor (BCF):** 15 Fish Estimated.**Propane****Bioaccumulation:** Bioconcentration potential is low (BCF < 100 or Log Pow < 3).**Partition coefficient: n-octanol/water(log Pow):** 2.36 Measured**Naphtha (petroleum), hydrodesulfurized heavy****Bioaccumulation:** Based on data from similar materials**Partition coefficient: n-octanol/water(log Pow):** > 4**Molybdenum disulfide****Bioaccumulation:** Partitioning from water to n-octanol is not applicable.**Polybutyl titanate****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**Mobility in soil****Butane (containing < 0.1% butadiene)**

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

Partition coefficient (Koc): 44 - 900 Estimated.**n-Butyl Acetate**

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

Partition coefficient (Koc): 19 - 70 Estimated.**Propane**

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

Partition coefficient (Koc): 24 - 460 Estimated.

Naphtha (petroleum), hydrodesulfurized heavy

No relevant data found.

Molybdenum disulfide

No relevant data found.

Polybutyl titanate

No relevant data found.

Graphite

No relevant data found.

Ethylbenzene

Potential for mobility in soil is low (Koc between 500 and 2000).

Partition coefficient (Koc): 518 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	Aerosols
UN number	UN 1950
Class	2.1
Packing group	
Reportable Quantity	Xylene, n-Butyl acetate

Classification for SEA transport (IMO-IMDG):

Proper shipping name	AEROSOLS
UN number	UN 1950

Class	2.1
Packing group	
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	Aerosols, flammable
UN number	UN 1950
Class	2.1
Packing group	

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)

Gases under pressure

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
Ethylbenzene	100-41-4

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

Calculated RQ exceeds reasonably attainable upper limit.

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)
Ethylbenzene	100-41-4	1000 lbs RQ
Ethylbenzene	100-41-4	100 lbs RQ (F003)
Benzene	71-43-2	10 lbs RQ (D018)
Benzene	71-43-2	10 lbs RQ
Xylene	1330-20-7	100 lbs RQ
Xylene	1330-20-7	100 lbs RQ (F003)

Pennsylvania Right To Know

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

Components**CASRN**

Butane (containing < 0.1% butadiene))	106-97-8
Propane	74-98-6
n-Butyl Acetate	123-86-4
Naphtha (petroleum), hydrodesulfurized heavy	64742-82-1
Molybdenum disulfide	1317-33-5
Polybutyl titanate	9022-96-2
Graphite	7782-42-5

California Prop. 65

WARNING: This product can expose you to chemicals including Ethylbenzene, Benzene, Quartz, which is/are known to the State of California to cause cancer, and WARNING: This product can expose you to chemicals including Ethylbenzene, Benzene, which is/are known to the State of California to cause cancer, and Benzene, 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
0	4	0

HMIS

Health	Flammability	Physical Hazard
3*	4	3

* = Chronic Effects (See Hazards Identification)

Revision

Identification Number: 4045681 / A749 / Issue Date: 10/16/2018 / Version: 7.0

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)
Asphyxiant	Asphyxiant
CAL PEL	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
Dow IHG	Dow Industrial Hygiene Guideline
OSHA P0	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
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
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, INC. 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