SAFETY DATA SHEET

DDP SPECIALTY ELECTRONIC MATERIALS US 9, LLC

Product name: MOLYKOTE® BR-2 Plus High Performance Grease

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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® BR-2 Plus High Performance Grease
Recommended use of the chemical and restrictions on use
Identified uses: Lubricants and lubricant additives

COMPANY IDENTIFICATION
DDP SPECIALTY ELECTRONIC MATERIALS
US 9, LLC
974 Centre Road
Wilmington DE 19805
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
Serious eye damage - Category 1

Label elements
Hazard pictograms

Signal word: **DANGER!**

Hazards
Causes serious eye damage.

Precautionary statements

Prevention
Wear eye protection/ face protection.

Response
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.

Other hazards
No data available

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature: Molybdenum disulfide grease
This product is a mixture.

Component	CASRN	Concentration
Distillates (petroleum), hydrotreated heavy naphthenic	64742-52-5	>= 38.0 - <= 46.0 %
Solvent dewaxed heavy paraffinic distillates	64742-65-0	>= 34.0 - <= 41.0 %
Lithium 12-hydroxyoctadecanoate	7620-77-1	>= 7.0 - <= 8.0 %
Solvent dewaxed residual oil (petroleum)	64742-62-7	>= 3.0 - <= 5.0 %
Phosphorodithioic acid, mixed O,O-bis(iso-Bu and pentyl) esters, zinc salts	68457-79-4	>= 3.0 - <= 4.0 %
Graphite	7782-42-5	>= 0.5 - <= 2.5 %
Molybdenum disulfide	1317-33-5	>= 0.5 - <= 2.5 %

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: No emergency medical treatment necessary.

Skin contact: Wash off with plenty of water. Suitable emergency safety shower facility should be available in work area.

Eye contact: Wash immediately and continuously with flowing water for at least 30 minutes. Remove contact lenses after the first 5 minutes and continue washing. Obtain prompt medical consultation, preferably from an ophthalmologist. Suitable emergency eye wash facility should be immediately available. Get medical attention immediately.

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: No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. FIREFIGHTING MEASURES

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

Unsuitable extinguishing media: None known.

Special hazards arising from the substance or mixture
Hazardous combustion products: Metal oxides Oxides of phosphorus Sulphur oxides Carbon oxides

Unusual Fire and Explosion Hazards: Exposure to combustion products may be a hazard to health.

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 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: 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. 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: Wipe up or scrape up and contain for salvage or disposal. 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 get on skin or clothing. Do not swallow. Do not get in eyes. Keep container tightly closed. Take care to prevent spills, waste and minimize release to the environment. Handle in accordance with good industrial hygiene and safety practice.
Use only with adequate ventilation. See Engineering measures under EXPOSURE CONTROLS/PERSONAL PROTECTION section.

Conditions for safe storage: Keep in properly labelled containers. Keep tightly closed. Store in accordance with the particular national regulations.

Do not store with the following product types: Strong oxidizing agents.
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
Distillates (petroleum), hydrotreated heavy naphthenic	OSHA Z-1	TWA Mist	5 mg/m3
	ACGIH	TWA Inhalable particulate matter	5 mg/m3
	Further information: URT irr: Upper Respiratory Tract irritation; A4: Not classifiable as a human carcinogen		
	CAL PEL	PEL particulate	5 mg/m3
	Further information: (I): As sampled by method that does not collect vapor.		
Solvent dewaxed heavy paraffinic distillates	OSHA Z-1	TWA Mist	5 mg/m3
	ACGIH	TWA Inhalable particulate matter	5 mg/m3
	Further information: URT irr: Upper Respiratory Tract irritation; A4: Not classifiable as a human carcinogen		
	CAL PEL	PEL particulate	5 mg/m3
	Further information: (I): As sampled by method that does not collect vapor.		

	NIOSH REL	TWA Mist	5 mg/m3
	NIOSH REL	ST Mist	10 mg/m3
	OSHA P0	TWA Mist	5 mg/m3
Lithium 12-hydroxyoctadecanoate	ACGIH	TWA Inhalable particulate matter	10 mg/m3
	Further information: LRT irr: Lower Respiratory Tract irritation; J: Does not include stearates of toxic metals.; A4: Not classifiable as a human carcinogen; varies: varies		
	ACGIH	TWA Respirable particulate matter	3 mg/m3
	Further information: LRT irr: Lower Respiratory Tract irritation; J: Does not include stearates of toxic metals.; A4: Not classifiable as a human carcinogen; varies: varies		
Solvent dewaxed residual oil (petroleum)	OSHA Z-1	TWA Mist	5 mg/m3
	ACGIH	TWA Inhalable particulate matter	5 mg/m3
	Further information: URT irr: Upper Respiratory Tract irritation; A4: Not classifiable as a human carcinogen		
	NIOSH REL	TWA Mist	5 mg/m3
	NIOSH REL	ST Mist	10 mg/m3
	OSHA P0	TWA Mist	5 mg/m3
Graphite	OSHA Z-1		See Further information
	Further information: (3): See table Z-3		
	OSHA Z-3	TWA Dust	15 Million particles per cubic foot
	Further information: a: Based on impinger samples counted by light-field techniques.; mppcf X 35.3 = million particles per cubic meter = particles per c.c		
	OSHA Z-1	TWA total dust	15 mg/m3
	OSHA Z-1	TWA respirable fraction	5 mg/m3
	ACGIH	TWA Respirable particulate matter	2 mg/m3
	Further information: pneumoconiosis: Pneumoconiosis		
	CAL PEL	PEL Total dust	10 mg/m3
	CAL PEL	PEL respirable dust fraction	5 mg/m3
	Further information: (n): The concentration and percentage of the particulate used for this limit are determined from the fraction passing a size selector with the following characteristics: Aerodynamic Diameter in Micrometers (unit density sphere)..... Percent Passing Selector 0 ..... 100 1 ..... 97 2 ..... 91 3 ..... 74 4 ..... 50 5 ..... 30 6 ..... 17 7 ..... 9 8 ..... 5 10 1		
	CAL PEL	PEL Respirable dust	2.5 mg/m3
	NIOSH REL	TWA Respirable	2.5 mg/m3
	Further information: Also see specific listing for Graphite (synthetic).		
	OSHA P0	TWA Total dust	10 mg/m3
	OSHA P0	TWA respirable dust fraction	5 mg/m3
	OSHA P0	TWA respirable dust fraction	2.5 mg/m3
Molybdenum disulfide	OSHA Z-1	TWA total dust	15 mg/m3 , Molybdenum

	ACGIH	TWA Inhalable particulate matter	10 mg/m3 , Molybdenum
	ACGIH	TWA Respirable particulate matter	3 mg/m3 , Molybdenum
	CAL PEL	PEL Total dust	10 mg/m3 , Molybdenum
	CAL PEL	PEL respirable dust fraction	3 mg/m3 , Molybdenum
	Further information: (n): The concentration and percentage of the particulate used for this limit are determined from the fraction passing a size selector with the following characteristics: Aerodynamic Diameter in Micrometers (unit density sphere)..... Percent Passing Selector 0 ..... 100 1 ..... 97 2 ..... 91 3 ..... 74 4 ..... 50 5 ..... 30 6 ..... 17 7 ..... 9 8 ..... 5 10 1		

Exposure controls
Engineering controls: Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations.

Individual protection measures
Eye/face protection: Use chemical goggles.
Skin protection
Hand protection: Use gloves chemically resistant to this material. 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, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. If there are no applicable exposure limit requirements or guidelines, use an approved respirator.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	
Physical state	Grease
Color	black
Odor	slight
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	**closed cup** >200 °C (392 °F)
Evaporation Rate (Butyl Acetate = 1)	Not applicable
Flammability (solid, gas)	Not classified as a flammability hazard
Lower explosion limit	No data available
Upper explosion limit	No data available
Vapor Pressure	Not applicable
Relative Vapor Density (air = 1)	No data available
Relative Density (water = 1)	0.89
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	No data available

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.

Conditions to avoid: None known.

Incompatible materials: Oxidizing agents

Hazardous decomposition products
No hazardous decomposition products are known.

11. TOXICOLOGICAL INFORMATION

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

Acute toxicity

Acute oral toxicity
Product test data not available. Refer to component data.

Acute dermal toxicity
Product test data not available. Refer to component data.

Acute inhalation toxicity
Product test data not available. Refer to component data.

Skin corrosion/irritation
Product test data not available. Refer to component data.

Serious eye damage/eye irritation
Product test data not available. Refer to component data.

Sensitization
Product test data not available. Refer to component data.

Specific Target Organ Systemic Toxicity (Single Exposure)
Product test data not available. Refer to component data.

Specific Target Organ Systemic Toxicity (Repeated Exposure)
Product test data not available. Refer to component data.

Carcinogenicity
Product test data not available. Refer to component data.

Teratogenicity
Product test data not available. Refer to component data.

Reproductive toxicity
Product test data not available. Refer to component data.

Mutagenicity
Product test data not available. Refer to component data.

Aspiration Hazard
Product test data not available. Refer to component data.

COMPONENTS INFLUENCING TOXICOLOGY:

Distillates (petroleum), hydrotreated heavy naphthenic

Acute oral toxicity
LD50, Rat, > 5,000 mg/kg

Acute dermal toxicity
LD50, Rabbit, > 2,000 mg/kg

Acute inhalation toxicity

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

LC50, Rat, 3 Hour, dust/mist, > 3.11 mg/l No deaths occurred at this concentration.

Skin corrosion/irritation
Prolonged contact is essentially nonirritating to skin.
Repeated contact may cause moderate skin irritation with local redness.

Serious eye damage/eye irritation
Essentially nonirritating to eyes.

Sensitization
Did not cause allergic skin reactions when tested in guinea pigs.

For respiratory sensitization:
No relevant information found.

Specific Target Organ Systemic Toxicity (Single Exposure)
Evaluation of available data suggests that this material is not an STOT-SE toxicant.

Specific Target Organ Systemic Toxicity (Repeated Exposure)
In animals, effects have been reported on the following organs after dermal exposure:
Skin.

Carcinogenicity
Has caused tumors in skin painting tests in animals. Not classifiable as a human carcinogen.

Teratogenicity
Did not cause birth defects or any other fetal effects in laboratory animals.

Reproductive toxicity
In animal studies, did not interfere with reproduction.

Mutagenicity
In vitro genetic toxicity studies were negative in some cases and positive in other cases.
Animal genetic toxicity studies were negative.

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

Solvent dewaxed heavy paraffinic distillates

Acute oral toxicity
Typical for this family of materials. LD50, Rat, > 5,000 mg/kg

Acute dermal toxicity
Typical for this family of materials. LD50, Rabbit, > 2,000 mg/kg

Acute inhalation toxicity
LC50, Rat, male and female, 4 Hour, dust/mist, > 5 mg/l No deaths occurred at this concentration.

Skin corrosion/irritation
Brief contact may cause slight skin irritation with local redness.

Prolonged contact may cause moderate skin irritation with local redness.

Serious eye damage/eye irritation
May cause slight eye irritation.
Corneal injury is unlikely.

Sensitization
For skin sensitization:
No relevant data found.

For respiratory sensitization:
No relevant data found.

Specific Target Organ Systemic Toxicity (Single Exposure)
The substance or mixture is not classified as specific target organ toxicant, single exposure.

Specific Target Organ Systemic Toxicity (Repeated Exposure)
For this family of materials:
In animals, effects have been reported on the following organs:
Liver.

Carcinogenicity
For this family of materials: Did not cause cancer in animal skin painting studies.

Teratogenicity
Typical for this family of materials. Has been toxic to the fetus in laboratory animals at doses toxic to the mother.

Reproductive toxicity
Typical for this family of materials. Limited data in laboratory animals suggest that the material does not affect reproduction.

Mutagenicity
Typical for this family of materials. In vitro genetic toxicity studies were predominantly negative.

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

Lithium 12-hydroxyoctadecanoate

Acute oral toxicity
LD50, Rat, female, > 2,000 mg/kg OECD Test Guideline 420 No deaths occurred at this concentration.

Acute dermal toxicity
LD50, Rat, male and female, > 2,000 mg/kg OECD Test Guideline 402 No deaths occurred at this concentration.

Acute inhalation toxicity
The LC50 has not been determined.

Skin corrosion/irritation
Brief contact is essentially nonirritating to skin.

Serious eye damage/eye irritation
May cause slight eye irritation.

Sensitization
Did not demonstrate the potential for contact allergy in mice.

For respiratory sensitization:
No relevant data found.

Specific Target Organ Systemic Toxicity (Single Exposure)
Evaluation of available data suggests that this material is not an STOT-SE toxicant.

Specific Target Organ Systemic Toxicity (Repeated Exposure)
Based on available data, repeated exposures are not anticipated to cause significant adverse effects.

Carcinogenicity
No relevant data found.

Teratogenicity
Did not cause birth defects in laboratory animals.

Reproductive toxicity
In animal studies, did not interfere with reproduction.

Mutagenicity
In vitro genetic toxicity studies were negative.

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

Solvent dewaxed residual oil (petroleum)

Acute oral toxicity
LD50, Rat, male and female, > 5,000 mg/kg

Acute dermal toxicity
LD50, Rabbit, male and female, > 2,000 mg/kg No deaths occurred at this concentration.

Acute inhalation toxicity
LC50, Rat, male and female, 4 Hour, dust/mist, > 5.53 mg/l No deaths occurred at this concentration.

Skin corrosion/irritation
Prolonged contact may cause moderate skin irritation with local redness.

Serious eye damage/eye irritation
May cause slight temporary eye irritation.
Corneal injury is unlikely.

Sensitization
Did not cause allergic skin reactions when tested in guinea pigs.
Did not cause allergic skin reactions when tested in humans.

For respiratory sensitization:

No relevant data found.

Specific Target Organ Systemic Toxicity (Single Exposure)
Evaluation of available data suggests that this material is not an STOT-SE toxicant.

Specific Target Organ Systemic Toxicity (Repeated Exposure)
In animals, effects have been reported on the following organs:
Liver.

Carcinogenicity
No relevant information found.

Teratogenicity
Did not cause birth defects or other effects in the fetus even at doses which caused toxic effects in the mother.

Reproductive toxicity
In animal studies, did not interfere with reproduction.

Mutagenicity
In vitro genetic toxicity studies were negative in some cases and positive in other cases.
Animal genetic toxicity studies were negative.

Aspiration Hazard
Based on available information, aspiration hazard could not be determined.

Phosphorodithioic acid, mixed O,O-bis(iso-Bu and pentyl) esters, zinc salts

Acute oral toxicity
LD50, Rat, male, 3,600 mg/kg

Acute dermal toxicity
LD50, Rabbit, male and female, > 20,000 mg/kg

Acute inhalation toxicity
The LC50 has not been determined.

Skin corrosion/irritation
Brief contact may cause slight skin irritation with local redness.

Serious eye damage/eye irritation
May cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness. Chemical burns may occur.

Sensitization
For skin sensitization:
Based on data from similar materials
Did not cause allergic skin reactions when tested in guinea pigs.

For respiratory sensitization:
No relevant data found.

Specific Target Organ Systemic Toxicity (Single Exposure)
Evaluation of available data suggests that this material is not an STOT-SE toxicant.

Specific Target Organ Systemic Toxicity (Repeated Exposure)
Observations in animals include:
Gastrointestinal irritation.

Carcinogenicity
No relevant data found.

Teratogenicity
No relevant data found.

Reproductive toxicity
No relevant data found.

Mutagenicity
For similar material(s): In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

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

Graphite

Acute oral toxicity
LD50, Rat, > 2,000 mg/kg OECD Test Guideline 401 No deaths occurred at this concentration.

Acute dermal toxicity
The dermal LD50 has not been determined.

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

Skin corrosion/irritation
Essentially nonirritating to skin.

Serious eye damage/eye irritation
May cause slight temporary eye irritation.
May cause slight temporary corneal injury.

Sensitization
Did not demonstrate the potential for contact allergy in mice.

For respiratory sensitization:
No relevant data found.

Specific Target Organ Systemic Toxicity (Single Exposure)
Evaluation of available data suggests that this material is not an STOT-SE toxicant.

Specific Target Organ Systemic Toxicity (Repeated Exposure)
Excessive exposure may cause irritation to upper respiratory tract (nose and throat) and lungs.

Carcinogenicity
No relevant data found.

Teratogenicity
Did not cause birth defects or any other fetal effects in laboratory animals.

Reproductive toxicity
In animal studies, did not interfere with reproduction.

Mutagenicity
In vitro genetic toxicity studies were negative.

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

Molybdenum disulfide

Acute oral toxicity
LD50, Rat, > 2,000 mg/kg No deaths occurred at this concentration.

Acute dermal toxicity
LD50, Rat, male and female, > 2,000 mg/kg No deaths occurred at this concentration.

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

Skin corrosion/irritation
Brief contact is essentially nonirritating to skin.
Prolonged contact may cause slight skin irritation with local redness.

Serious eye damage/eye irritation
May cause slight temporary eye irritation.
Corneal injury is unlikely.

Sensitization
For skin sensitization:
Did not cause allergic skin reactions when tested in guinea pigs.

For respiratory sensitization:
No relevant data found.

Specific Target Organ Systemic Toxicity (Single Exposure)
Evaluation of available data suggests that this material is not an STOT-SE toxicant.

Specific Target Organ Systemic Toxicity (Repeated Exposure)
No relevant data found.

Carcinogenicity
No relevant data found.

Teratogenicity
No relevant data found.

Reproductive toxicity
No relevant data found.

Mutagenicity
For similar material(s): In vitro genetic toxicity studies were negative.

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

12. ECOLOGICAL INFORMATION

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

Toxicity

Distillates (petroleum), hydrotreated heavy naphthenic

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, Oncorhynchus mykiss (rainbow trout), static test, 96 Hour, > 1,000 mg/l, OECD Test Guideline 203 or Equivalent
LC50, Oncorhynchus mykiss (rainbow trout), 96 Hour, > 5,000 mg/l, OECD Test Guideline 203 or Equivalent

Acute toxicity to aquatic invertebrates
EC50, Daphnia magna (Water flea), static test, 48 Hour, > 1,000 mg/l, OECD Test Guideline 202 or Equivalent
EC50, scud Gammarus sp., 96 Hour, > 10,000 mg/l, Method Not Specified.

Acute toxicity to algae/aquatic plants
EbC50, alga Scenedesmus sp., static test, 96 Hour, Biomass, > 1,000 mg/l, OECD Test Guideline 201 or Equivalent

Chronic toxicity to fish
NOEC, Pimephales promelas (fathead minnow), 7 d, growth, > 5,000 mg/l

Chronic toxicity to aquatic invertebrates
NOEC, Daphnia magna (Water flea), 21 d, number of offspring, > 1,000 mg/l

Solvent dewaxed heavy paraffinic distillates

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).
LL50, Pimephales promelas (fathead minnow), static test, 96 Hour, > 100 mg/l

Acute toxicity to aquatic invertebrates
EL50, Daphnia magna (Water flea), static test, 48 Hour, > 10,000 mg/l

Acute toxicity to algae/aquatic plants
NOEC, Pseudokirchneriella subcapitata (green algae), static test, 72 Hour, Growth rate, > 100 mg/l

Toxicity to bacteria
Based on data from similar materials
NOEC, 10 min, > 1.93 mg/l, DIN 38 412 Part 8

Chronic toxicity to aquatic invertebrates
Based on data from similar materials
NOEC, Daphnia magna (Water flea), 21 d, 10 mg/l

Lithium 12-hydroxyoctadecanoate

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, Oncorhynchus mykiss (rainbow trout), semi-static test, 96 Hour, > 100 mg/l, OECD Test Guideline 203

Acute toxicity to aquatic invertebrates
EC50, Daphnia magna (Water flea), static test, 48 Hour, > 100 mg/l, OECD Test Guideline 202

Acute toxicity to algae/aquatic plants
EC50, Pseudokirchneriella subcapitata (green algae), static test, 72 Hour, Growth rate, > 160 mg/l, OECD Test Guideline 201

Solvent dewaxed residual oil (petroleum)

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).
LL50, Pimephales promelas (fathead minnow), Static, 96 Hour, > 100 mg/l, OECD Test Guideline 203 or Equivalent

Acute toxicity to aquatic invertebrates
LL50, scud Gammarus sp., semi-static test, 48 Hour, > 10,000 mg/l, OECD Test Guideline 202 or Equivalent
EL50, water flea Daphnia magna, Static, 48 Hour, > 10,000 mg/l, OECD Test Guideline 202 or Equivalent

Acute toxicity to algae/aquatic plants
NOEC, green alga Pseudokirchneriella subcapitata (formerly known as Selenastrum capricornutum), Static, 72 Hour, Growth rate inhibition, > 100 mg/l, OECD Test Guideline 201 or Equivalent

Toxicity to bacteria
Based on data from similar materials
NOEC, 10 min, > 1.93 mg/l

Chronic toxicity to aquatic invertebrates
NOEC, Daphnia magna, semi-static test, 21 d, number of offspring, 10 mg/l

Phosphorodithioic acid, mixed O,O-bis(iso-Bu and pentyl) esters, zinc salts

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, Cyprinodon variegatus (sheepshead minnow), semi-static test, 96 Hour, 4.5 mg/l, OECD Test Guideline 203

Acute toxicity to aquatic invertebrates

Based on data from similar materials
EL50, Daphnia magna (Water flea), static test, 48 Hour, 23 mg/l, OECD Test Guideline 202

Acute toxicity to algae/aquatic plants
Based on data from similar materials
EL50, Desmodesmus subspicatus (green algae), 72 Hour, 24 mg/l, OECD Test Guideline 201

Toxicity to bacteria
Based on data from similar materials
EC50, 3 Hour, > 1,000 mg/l, OECD Test Guideline 209

Chronic toxicity to aquatic invertebrates
Based on data from similar materials
NOEC, Daphnia magna (Water flea), 21 d, 0.4 mg/l

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

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

Persistence and degradability

Distillates (petroleum), hydrotreated heavy naphthenic

Biodegradability: Material is expected to biodegrade very slowly (in the environment). Fails to pass OECD/EEC tests for ready biodegradability. Material is inherently biodegradable (reaches > 20% biodegradation in OECD test(s) for inherent biodegradability).
10-day Window: Fail
Biodegradation: 6 %
Exposure time: 28 d
Method: OECD Test Guideline 301B or Equivalent
10-day Window: Fail
Biodegradation: 22 - 51 %
Exposure time: 21 - 28 d

Photodegradation
Test Type: Half-life (indirect photolysis)
Sensitization: OH radicals

Solvent dewaxed heavy paraffinic distillates

Biodegradability: Material is expected to biodegrade very slowly (in the environment). Fails to pass OECD/EEC tests for ready biodegradability.
10-day Window: Fail
Biodegradation: 2 %
Exposure time: 28 d
Method: OECD Test Guideline 301B

Lithium 12-hydroxyoctadecanoate

Biodegradability: Material is readily biodegradable. Passes OECD test(s) for ready biodegradability.
10-day Window: Pass
Biodegradation: 78 %
Exposure time: 28 d
Method: OECD Test Guideline 301C

Solvent dewaxed residual oil (petroleum)

Biodegradability: Based on information for a similar material: Material is expected to biodegrade very slowly (in the environment). Fails to pass OECD/EEC tests for ready biodegradability.

Phosphorodithioic acid, mixed O,O-bis(iso-Bu and pentyl) esters, zinc salts

Biodegradability: Material is expected to biodegrade very slowly (in the environment). Fails to pass OECD/EEC tests for ready biodegradability.
Based on data from similar materials 10-day Window: Fail
Biodegradation: 1.5 %
Exposure time: 28 d
Method: OECD Test Guideline 301B

Graphite

Biodegradability: Biodegradation is not applicable.

Molybdenum disulfide

Biodegradability: Biodegradability is not applicable to inorganic substances.

Bioaccumulative potential

Distillates (petroleum), hydrotreated heavy naphthenic

Bioaccumulation: Bioconcentration potential is high (BCF > 3000 or Log Pow between 5 and 7).
Partition coefficient: n-octanol/water(log Pow): 3.9 - 6 Estimated.

Solvent dewaxed heavy paraffinic distillates

Bioaccumulation: Bioconcentration potential is high (BCF > 3000 or Log Pow between 5 and 7).
Partition coefficient: n-octanol/water(log Pow): 3.9 - 6 Estimated.

Lithium 12-hydroxyoctadecanoate

Bioaccumulation: No relevant data found.

Solvent dewaxed residual oil (petroleum)

Bioaccumulation: No relevant data found.

Phosphorodithioic acid, mixed O,O-bis(iso-Bu and pentyl) esters, zinc salts

Bioaccumulation: For similar material(s): Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient: n-octanol/water(log Pow): 0.69 OECD Test Guideline 107

Graphite

Bioaccumulation: No relevant data found.

Molybdenum disulfide

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

Mobility in soil

Distillates (petroleum), hydrotreated heavy naphthenic

No data available.

Solvent dewaxed heavy paraffinic distillates

No relevant data found.

Lithium 12-hydroxyoctadecanoate

No relevant data found.

Solvent dewaxed residual oil (petroleum)

No relevant data found.

Phosphorodithioic acid, mixed O,O-bis(iso-Bu and pentyl) esters, zinc salts

No specific, relevant data available for assessment.

Graphite

No relevant data found.

Molybdenum disulfide

No relevant data found.

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 Section10 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

Not regulated for transport

Classification for SEA transport (IMO-IMDG):

Not regulated for transport

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):

Not regulated for transport

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
Serious eye damage or eye irritation

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**
Phosphorodithioic acid, mixed O,O-bis(iso-Bu and pentyl) esters, zinc salts	68457-79-4
Zinc sulfide	1314-98-3
Zinc oxide	1314-13-2

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	1	0

HMIS

Health	Flammability	Physical Hazard
3/	1	0

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Legend

ACGIH	USA. ACGIH Threshold Limit Values (TLV)
CAL PEL	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
NIOSH REL	USA. NIOSH Recommended Exposure Limits
OSHA P0	USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values)
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
ST	STEL - 15-minute TWA exposure that should not be exceeded at any time during a workday
TWA	8-hour time weighted average

Full text of other abbreviations
AIIC - Australian Inventory of Industrial Chemicals; 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; TECI - Thailand Existing Chemicals 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.

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