



Material Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION

MEGAPOSIT™ SPR™ 220-4.5 POSITIVE PHOTORESIST

Revision Date: 07/02/2013

Supplier ROHM AND HAAS ELECTRONIC MATERIALS LLC
A Subsidiary of The Dow Chemical Company
455 FOREST STREET
MARLBOROUGH, MA 01752 United States

For non-emergency information contact: 215-592-3000

Emergency telephone number
1 800 424 9300

Local emergency telephone number
989-636-4400

®™*Trademark of The Dow Chemical Company ("Dow") or an affiliated company of Dow

2. COMPOSITION/INFORMATION ON INGREDIENTS

| Component | CAS-No. | Concentration |
|-----------------------------|-----------|---------------|
| Cresol novolak resin | | 25.0 - 35.0 % |
| Ethyl lactate | 97-64-3 | 25.0 - 35.0 % |
| Anisole | 100-66-3 | 10.0 - 20.0 % |
| Diazo Photoactive Compound | | 1.0 - 10.0 % |
| 2-Methyl Butyl Acetate | 624-41-9 | 1.0 - 10.0 % |
| n-amyl acetate | 628-63-7 | 1.0 - 10.0 % |
| Cresol | 1319-77-3 | < 1.0 % |
| Organic Siloxane Surfactant | | < 1.0 % |
| Dioxane | 123-91-1 | < 0.2 % |

3. HAZARDS IDENTIFICATION

Emergency Overview

Appearance

Form liquid

Colour Red Amber
Odour ester-like

Hazard Summary

CAUTION!

Combustible liquid and vapor. Causes irritation to eyes, nose, and respiratory tract.
Prolonged, repeated contact, inhalation, ingestion, or absorption through the skin, may cause adverse effects to internal organ systems.

Potential Health Effects

Primary Routes of Entry: Inhalation, ingestion, eye and skin contact, absorption.

Eyes: May cause pain, transient irritation and superficial corneal effects.

Skin: Material may cause irritation.

Prolonged or repeated exposure may have the following effects:

central nervous system depression

drowsiness

defatting of skin leading to irritation and dermatitis

Ingestion: Swallowing may have the following effects:

irritation of mouth, throat and digestive tract

Repeated doses may have the following effects:

central nervous system depression

drowsiness

Inhalation: Inhalation may have the following effects:

irritation of nose, throat and respiratory tract

Higher concentrations may have the following effects:

systemic effects similar to those resulting from ingestion

Target Organs: Eye

Respiratory System

Skin

nervous system

Carcinogenicity

Not considered carcinogenic by NTP, IARC, and OSHA

4. FIRST AID MEASURES

Inhalation: Remove from exposure. If there is difficulty in breathing, give oxygen. Seek medical attention if symptoms persist.

Skin contact: Wash skin with water. Continue washing for at least 15 minutes. Obtain medical attention if blistering occurs or redness persists.

Eye contact: Immediately flush the eye with plenty of water for at least 15 minutes, holding the eye open. Obtain medical attention if soreness or redness persists.

Ingestion: Wash out mouth with water. Have victim drink 1-3 glasses of water to dilute stomach contents. Induce vomiting if person is conscious. Immediate medical attention is required. Never administer anything by mouth if a victim is losing consciousness, is unconscious or is convulsing.

Notes to physician: Treat symptomatically.

5. FIREFIGHTING MEASURES

| | |
|------------------------------|--|
| Flash point | 45 °C (113 °F) |
| Ignition temperature | ca.400.0 °C (752 °F) Literature Ethyl lactate |
| Lower explosion limit | 0.34 % volLiterature Anisole |
| Upper explosion limit | 6.3 % volLiterature Anisole |

Suitable extinguishing media: Use water spray, foam, dry chemical or carbon dioxide. Keep containers and surroundings cool with water spray.

Specific hazards during firefighting: This product may give rise to hazardous vapors in a fire. Vapors can travel a considerable distance to a source of ignition and result in flashback.

Special protective equipment for firefighters: Wear full protective clothing and self-contained breathing apparatus.

Further information: Pressure may build up in closed containers with possible liberation of combustible vapors.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Wear suitable protective clothing.
Wear respiratory protection.
Eliminate all ignition sources.

Environmental precautions

Prevent the material from entering drains or water courses.
Do not discharge directly to a water source.
Advise Authorities if spillage has entered watercourse or sewer or has contaminated soil or vegetation.

Methods for cleaning up

Contain spills immediately with inert materials (e.g., sand, earth).
Transfer into suitable containers for recovery or disposal.
Finally flush area with plenty of water.

7. HANDLING AND STORAGE

Handling

Use local exhaust ventilation. Avoid contact with eyes, skin and clothing. Keep container tightly closed.

Storage

Storage conditions: Store in original container. Keep away from heat and sources of ignition.

Storage area should be: cool dry well ventilated out of direct sunlight

Further information on storage conditions: Keep away from heat, sparks, flame, and other sources of ignition. Practice good personal hygiene to prevent accidental exposure.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limit(s)

Exposure limits are listed below, if they exist.

| Component | Regulation | Type of listing | Value |
|------------------------|---------------|----------------------------------|-------------------|
| Ethyl lactate | Rohm and Haas | TWA | 5 ppm |
| Anisole | Rohm and Haas | TWA | 5 ppm |
| Anisole | Rohm and Haas | STEL | 10 ppm |
| 2-Methyl Butyl Acetate | Rohm and Haas | TWA | 50 ppm |
| 2-Methyl Butyl Acetate | Rohm and Haas | TWA | 50 ppm |
| 2-Methyl Butyl Acetate | Rohm and Haas | STEL | 100 ppm |
| 2-Methyl Butyl Acetate | Rohm and Haas | STEL | 100 ppm |
| 2-Methyl Butyl Acetate | ACGIH | TWA | 50 ppm |
| 2-Methyl Butyl Acetate | ACGIH | STEL | 100 ppm |
| n-amyl acetate | Rohm and Haas | TWA | 50 ppm |
| n-amyl acetate | Rohm and Haas | STEL | 100 ppm |
| n-amyl acetate | OSHA P1 | TWA | 525 mg/m3 100 ppm |
| n-amyl acetate | OSHA P0 | TWA | 525 mg/m3 100 ppm |
| n-amyl acetate | NIOSH REL | TWA | 525 mg/m3 100 ppm |
| Cresol | OSHA P1 | TWA | 22 mg/m3 5 ppm |
| Cresol | OSHA P1 | TWA | |
| Cresol | OSHA P0 | TWA | 22 mg/m3 5 ppm |
| Cresol | ACGIH | TWA | |
| Cresol | ACGIH | TWA Inhalable fraction and vapor | 20 mg/m3 |
| Cresol | ACGIH | TWA | |
| Cresol | OSHA P0 | TWA | 22 mg/m3 5 ppm |
| Dioxane | Rohm and Haas | TWA | 5 ppm |
| Dioxane | Rohm and Haas | Absorbed via skin | |
| Dioxane | ACGIH | TWA | 20 ppm |
| Dioxane | ACGIH | TWA | |
| Dioxane | OSHA P1 | TWA | 360 mg/m3 100 ppm |
| Dioxane | OSHA P1 | TWA | |
| Dioxane | OSHA P0 | TWA | 90 mg/m3 25 ppm |
| Dioxane | NIOSH REL | C | 3.6 mg/m3 1 ppm |

Exposure controls

Engineering measures: Engineering methods to prevent or control exposure are preferred. Methods include process or personnel enclosure, mechanical ventilation (local exhaust), and control of process conditions.

Individual protection measures

Eye/face protection: Goggles

Skin protection

Hand protection: Butyl rubber gloves. Other chemical resistant gloves may be recommended by your safety professional.

Other protection: Normal work wear.

Respiratory protection: Respiratory protection if there is a risk of exposure to high vapor concentrations. The specific respirator selected must be based on the airborne concentration found in the workplace and must not exceed the working limits of the respirator.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

| | |
|------------------------------------|------------------------------|
| Form | liquid |
| Colour | Red Amber |
| Odour | ester-like |
| pH | 7 |
| Boiling point/boiling range | 150 °C (302 °F) |
| Flash point | 45 °C (113 °F) |
| Evaporation rate | Slower than ether |
| Lower explosion limit | 0.34 % volLiterature Anisole |
| Upper explosion limit | 6.3 % volLiterature Anisole |

Component: **Ethyl lactate**

Vapour pressure 1.7 mmHg at 20 °C (68 °F)

Component: **Anisole**

Vapour pressure 9.7 mmHg at 42 °C (108 °F)

Component: **Dioxane**

Vapour pressure 27.0 mmHg at 20 °C (68 °F)

| | |
|----------------------------------|---|
| Relative vapour density | Heavier than air. |
| Relative density | 1.07 |
| Water solubility | insoluble |
| Auto-ignition temperature | ca.400 °C (752 °F) Literature Ethyl lactate |
| VOC's | 710.00 g/L |

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

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Chemical stability | Stable under normal conditions. |
| Hazardous reactions | No dangerous reaction known under conditions of normal use. |
| Conditions to avoid | High temperatures Static discharge |
| Materials to avoid | Oxidizing agents Bases Acids |
| Hazardous decomposition products | Carbon monoxide, carbon dioxide, phenols, oxides of sulfur, nitrogen oxides (NOx), |
| polymerisation | Product will not undergo hazardous polymerization. |

11. TOXICOLOGICAL INFORMATION

Toxicological information on this product or its components appear in this section when such data is available.

Component: **Ethyl lactate**

Acute oral toxicity LD50 rat > 2,000 mg/kg OECD Test Guideline 425

Component: **Anisole**

Acute oral toxicity LD50 rat 3,700 mg/kg

Component: **Diazo Photoactive Compound**

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

Component: **2-Methyl Butyl Acetate**

Acute oral toxicity LD50 rat 12,306 mg/kg

Component: **n-amyl acetate**

Acute oral toxicity LD50 rat > 1,600 mg/kg

Component: **Cresol**

Acute oral toxicity LD50 rat 100 - 300 mg/kg

Component: **Dioxane**

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

Component: **Ethyl lactate**

Acute inhalation toxicity LC0 rat 4 Hour 5.4 mg/l

- Component: **Diazo Photoactive Compound**
Acute inhalation toxicity No adverse effects are anticipated from single exposure to dust.
- Component: **2-Methyl Butyl Acetate**
Acute inhalation toxicity LC50 rat 4 Hour > 5.2 mg/l
- Component: **n-amyl acetate**
Acute inhalation toxicity 16,000 mg/m³
- Component: **n-amyl acetate**
Acute inhalation toxicity no data available
- Component: **Cresol**
Acute inhalation toxicity LC50 rat 8 Hour 35.38 mg/l
- Component: **Dioxane**
Acute inhalation toxicity Prolonged excessive exposure may cause serious adverse effects, even death.
May cause central nervous system effects.
Excessive exposure may cause irritation to upper respiratory tract (nose and throat) and lungs.
Symptoms of excessive exposure may be anesthetic or narcotic effects; dizziness and drowsiness may be observed.
May cause pulmonary edema (fluid in the lungs.)
- Component: **Dioxane**
Acute inhalation toxicity LC50 rat 4 Hour 51.3 mg/l
- Component: **Ethyl lactate**
Acute dermal toxicity LD50 rat > 5,000 mg/kg
- Component: **Anisole**
Acute dermal toxicity The dermal LD50 has not been determined.
- Component: **Diazo Photoactive Compound**
Acute dermal toxicity Prolonged skin contact is unlikely to result in absorption of harmful amounts.
- Component: **2-Methyl Butyl Acetate**
Acute dermal toxicity LD50 rabbit 8,359 mg/kg
- Component: **n-amyl acetate**
Acute dermal toxicity LD50 rabbit > 17,500 mg/kg
- Component: **Cresol**
Acute dermal toxicity LD50 rabbit 213 - 426 mg/kg
- Component: **Dioxane**
Acute dermal toxicity LD50 rabbit > 7,000 mg/kg
- Component: **Anisole**
Skin irritation A single application to rabbit skin produced mild irritation.
- Component: **Diazo Photoactive Compound**

| | |
|---|---|
| Skin irritation | No relevant data found. |
| Component: <u>2-Methyl Butyl Acetate</u> | |
| Skin irritation | rabbit Moderate irritation. |
| Component: <u>n-amyl acetate</u> | |
| Skin irritation | no data available |
| Component: <u>Cresol</u> | |
| Skin irritation | rabbit Causes burns. |
| Component: <u>Dioxane</u> | |
| Skin irritation | No skin irritation Brief contact is essentially nonirritating to skin. May cause drying and flaking of the skin. Prolonged contact may cause skin irritation with local redness. |
| Component: <u>Ethyl lactate</u> | |
| Eye irritation | moderate to severe. Single application to the rabbit eye produced conjunctival irritation. |
| Component: <u>Diazo Photoactive Compound</u> | |
| Eye irritation | No relevant data found. |
| Component: <u>2-Methyl Butyl Acetate</u> | |
| Eye irritation | rabbit Moderate eye irritation |
| Component: <u>n-amyl acetate</u> | |
| Eye irritation | slight irritation |
| Component: <u>Cresol</u> | |
| Eye irritation | rabbit Corrosive |
| Component: <u>Dioxane</u> | |
| Eye irritation | Eye irritation May cause slight eye irritation. May cause slight corneal injury. Vapor may cause eye irritation experienced as mild discomfort and redness. |
| Component: <u>Ethyl lactate</u> | |
| Sensitisation | no data available |
| Component: <u>Diazo Photoactive Compound</u> | |
| Sensitisation | No relevant data found. |
| Component: <u>Diazo Photoactive Compound</u> | |
| Sensitisation | No relevant data found. |
| Component: <u>2-Methyl Butyl Acetate</u> | |
| Sensitisation | HRIPT (human repeat insult patch test) human Not a sensitizer. |
| Component: <u>n-amyl acetate</u> | |

| | |
|---|---|
| Sensitisation | no data available |
| Component: <u>Dioxane</u> Sensitisation | For skin sensitization: No relevant information found. |
| Component: <u>Dioxane</u> Sensitisation | For respiratory sensitization: No relevant information found. |
| Component: <u>Ethyl lactate</u> Carcinogenicity: | no data available |
| Component: <u>Ethyl lactate</u> Reproductive toxicity | no data available |
| Component: <u>Ethyl lactate</u> Teratogenicity | Development effects were not observed in laboratory animals. |
| Component: <u>Ethyl lactate</u> Mutagenicity | Reverse mutation test using bacteria: Non-mutagenic with and without metabolic activation |
| Component: <u>Diazo Photoactive Compound</u> Subchronic toxicity | No relevant data found. |
| Component: <u>Diazo Photoactive Compound</u> Carcinogenicity: | No relevant data found. |
| Component: <u>Diazo Photoactive Compound</u> Reproductive toxicity | No relevant data found. |
| Component: <u>Diazo Photoactive Compound</u> Teratogenicity | No relevant data found. |
| Component: <u>Diazo Photoactive Compound</u> Mutagenicity | No relevant data found. |
| Component: <u>2-Methyl Butyl Acetate</u> Mutagenicity | Tests on bacterial or mammalian cell cultures did not show mutagenic effects. |
| Component: <u>n-amyl acetate</u> Subchronic toxicity | Inhalation rat NOAEL: 1,200 mg/kg none |
| Component: <u>n-amyl acetate</u> Carcinogenicity: | No data found |
| Component: <u>n-amyl acetate</u> Reproductive toxicity | No data found |
| | Exposure of pregnant rabbits to vapor at 1500 ppm resulted in maternal toxicity. The following effects were observed: decreased body weight. No adverse reproductive effects were observed in experimental animals. |
| Component: <u>n-amyl acetate</u> | |

Teratogenicity

No data found

Component: **n-amyl acetate**

Mutagenicity

Not mutagenic in Ames Test.

Component: **Cresol**

Teratogenicity

Developmental effects were seen in laboratory animals only at dose levels that were maternally toxic.

Component: **Cresol**

Mutagenicity

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

Component: **Dioxane**

Subchronic toxicity

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

Liver.

Kidney.

Nasal tissue.

May cause central nervous system effects.

Component: **Dioxane**

Carcinogenicity: Human epidemiology studies have shown no indication that exposures to 1,4-dioxane in industrial situations have caused an increased incidence of tumors even though it has been shown to cause cancer in some laboratory animals.

Component: **Dioxane**

Reproductive toxicity

Limited data in laboratory animals suggest that the material does not affect reproduction.

Component: **Dioxane**

Teratogenicity

Has been toxic to the fetus in laboratory animals at doses toxic to the mother. Did not cause birth defects in laboratory animals.

Component: **Dioxane**

Mutagenicity

In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

12. ECOLOGICAL INFORMATION

Ecotoxicological information on this product or its components appear in this section when such data is available.

Ethyl lactate**Elimination information (persistence and degradability)****Biodegradability**

OECD Test Guideline 302
75 %

Ecotoxicity effects**Toxicity to fish**

LC50 Zebra fish (Danio/Brachydanio rerio) 96 Hour OECD Test
Guideline 203 or Equivalent
320 mg/l

Toxicity to algae ErC50 green alga Pseudokirchneriella subcapitata (formerly known as Selenastrum capricornutum) 96 Hour
3,500 mg/l

Toxicity to aquatic invertebrates EC50 Daphnia magna (Water flea) 48 Hour
560 mg/l

Anisole

Ecotoxicity effects

Toxicity to algae Growth rate EC50 Pseudokirchneriella subcapitata (green algae) 96 Hour
162 mg/l

Diazo Photoactive Compound

Elimination information (persistence and degradability)

Biodegradability

No relevant data found.

Bioaccumulation

No data available.

Ecotoxicity effects

Toxicity to fish

No relevant data found.

2-Methyl Butyl Acetate

Ecotoxicity effects

Toxicity to fish

LC50 Fathead minnow (Pimephales promelas) 96 Hour Method Not Specified
69 mg/l

Toxicity to algae

EC50 Pseudokirchneriella subcapita 96 Hour
>466 mg/l

Toxicity to aquatic invertebrates

EC50 Daphnia magna 48 Hour OECD Test Guideline 202 or Equivalent
40.9 mg/l

n-amyl acetate

Ecotoxicity effects

Toxicity to fish

LC50 Mosquito fish (Gambusia affinis) 96 Hour
65 mg/l

Toxicity to fish

no data available

Toxicity to algae

EC50 Algae 24 Hour
550 mg/l

Toxicity to algae

no data available

Toxicity to aquatic invertebrates

EC50 Daphnia magna 24 Hour
210 mg/l

Toxicity to aquatic invertebrates no data available

Cresol

Ecotoxicity effects

Toxicity to fish LC50 Zebra fish (Danio/Brachydanio rerio) 96 Hour Method Not Specified
9 mg/l

Toxicity to fish LC50 Bluegill sunfish (Lepomis macrochirus) 96 Hour Method Not Specified
10 mg/l

Toxicity to fish LC50 Pimephales promelas (fathead minnow) 96 Hour Method Not Specified
12.8 mg/l

Toxicity to bacteria EC0 Pseudomonas putida 0.5 Hour
250 mg/l

Toxicity to aquatic invertebrates LC50 Daphnia 48 Hour Method Not Specified
33 - 100 mg/l

Dioxane

Elimination information (persistence and degradability)

Biodegradability

Based on stringent OECD test guidelines, this material cannot be considered as readily biodegradable; however, these results do not necessarily mean that the material is not biodegradable under environmental conditions.

Biodegradability OECD Test Guideline 301C or Equivalent Not biodegradable.
29 %
10-day Window: Not applicable

Bioaccumulation Cyprinus carpio (Carp) 42 d 25 °C
Concentration: 10 mg/l
Bioconcentration factor (BCF): 0.2 - 0.6

Ecotoxicity effects

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).

Toxicity to fish static test LC50 Pimephales promelas (fathead minnow) 96 Hour OECD Test Guideline 203 or Equivalent
13,000 mg/l

Toxicity to aquatic invertebrates static test EC50 Daphnia magna (Water flea) 24 Hour OECD Test Guideline 202 or Equivalent
8,450 mg/l

Chemical Fate

Biochemical Oxygen Demand (BOD) 20 %
Biochemical Oxygen Demand (BOD) 23 %
Biochemical Oxygen Demand (BOD) 30 %

13. DISPOSAL CONSIDERATIONS

Environmental precautions: Prevent the material from entering drains or water courses. Do not discharge directly to a water source. Advise Authorities if spillage has entered watercourse or sewer or has contaminated soil or vegetation.

Disposal

Dispose in accordance with all local, state (provincial), and federal regulations. Incineration is the recommended method of disposal for containers. Under RCRA, it is the responsibility of the product's user to determine at the time of disposal, whether the product meets RCRA criteria for hazardous waste. This is because the product uses, transformations, mixtures, processes, etc. may render the resulting materials hazardous.

Do not remove label until container is thoroughly cleaned. Empty containers may contain hazardous residues. This material and its container must be disposed of in a safe way.

14. TRANSPORT INFORMATION

DOT

Not regulated per 49CFR 173.150(f)(2)

Classification for SEA transport (IMO-IMDG):

| | |
|----------------------|----------------|
| Proper shipping name | RESIN SOLUTION |
| UN number | UN 1866 |
| Class | 3 |
| Packing group | III |

Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations.

15. REGULATORY INFORMATION

Workplace Classification

OSHA: Combustible
Irritant
Target organ effects

WHMIS: This product is a 'controlled product' under the Canadian Workplace Hazardous Materials Information System (WHMIS).

SARA TITLE III: Section 311/312 Categorizations (40CFR370): Immediate, delayed, flammability hazard

SARA TITLE III: Section 313 Information (40CFR372)

This product does not contain a chemical which is listed in Section 313 at or above de minimis concentrations.

United States TSCA Inventory (US.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.

California (Proposition 65)

This product does not contain materials which the State of California has found to cause cancer, birth defects or other reproductive harm.

16. OTHER INFORMATION**NFPA Hazard Rating**

| Health | Fire | Reactivity |
|--------|------|------------|
| 2 | 2 | 0 |

Legend

| | |
|-------|---|
| ACGIH | American Conference of Governmental Industrial Hygienists |
| BAC | Butyl acetate |
| OSHA | Occupational Safety and Health Administration |
| PEL | Permissible Exposure Limit |
| STEL | Short Term Exposure Limit (STEL): |
| TLV | Threshold Limit Value |
| TWA | Time Weighted Average (TWA): |
| | Bar denotes a revision from prior MSDS. |

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Version: 1.3
Print Date: 02/19/2014

Layout 101100140