

Material Safety Data Sheet

HAZARDS IDENTIFICATION

Potential Health Effects

OVERVIEW: The most likely routes of worker overexposure to this product are skin contact and inhalation. Skin irritation and / or other effects of skin contact are easily avoided by: using proper gloves, reading "Protection Information" section below; not touching exposed skin (like your neck or face) or clothing with contaminated gloves; using proper glove removal techniques; washing affected areas immediately if skin contact occurs; washing hands before leaving the work area. Inhalation exposure would occur by breathing the product's volatile components, which begin to evaporate at room temperature when product container is opened. Volatile solvents continue to evaporate during room temperature use of the product, such as pouring from the jar to the dispensing machine and spin coating. Mist and solvent vapors will evolve if a spray application is used. During the wafer or substrate drying (125 - 150 deg C) and the final curing (300 - 450 deg C) any remaining solvent shall volatilize. Consideration should be given to avoiding overexposure to chemicals used in related processes. For example, avoid over exposure to chemicals used as "product thinners", solvents used to clean process equipment, and other chemicals used in the operation such as wafer etchants and parts cleaners. Personnel performing maintenance and repairs on dispensing equipment (e.g. spin coaters) may need personnel protective equipment such as respirators, gloves, goggles, and protective clothing to prevent exposure to accumulated materials. Well-designed area and personal air sampling /analysis can show whether exposures are within the required / recommended limits. Properly designed engineering controls such as local ventilation and process enclosures are effective ways to reduce the environmental concentrations to permissible limits. Respirators should be used when engineering and work practice controls are not technically feasible, or when such controls are in the process of being installed, or when the engineering controls fail and need to be supplemented. (See the "Exposure Limits" table below for more information). Process controls and procedures must comply with all applicable Federal, State (or Provincial) and Local safety, health and environmental laws, regulations and ordinances. In addition, it is always prudent to use all the practical means to limit worker exposure to chemicals. Significant differences in overall exposure can be made by using practical measures such as:

- Inhalation - Minimize exposure by keeping containers of product, solvents, solvent-dampened clean wipes, etc, covered;
- Skin - Avoid contact by selecting proper gloves, and know how to them properly;
- Eye - Wear chemical safety glasses when handling the

Material Safety Data Sheet

(HAZARDS IDENTIFICATION - Continued)

product, solvents and waste materials, and where there is potential for splashing wear chemical goggles and face shield;

· Ingestion - Avoid inadvertent ingestion by washing the hands before eating, drinking, or smoking, and restrict these activities to locations outside of the work area.

PRINCIPAL HEALTH EFFECTS:

n-Methylpyrrolidone

Toxic effects described in animals include: BY SKIN CONTACT: No skin sensitization; BY INHALATION: Altered respiratory rate; Nonspecific effects, e.g., weight loss and irritation. Toxic effects of repeated or prolonged animal exposures include: BY INHALATION: Lethargy/inactivity; Weight loss; Bone marrow effects; Increased mortality; Testicular effects; BY INGESTION: Decreased body weight; Blood effects; Kidney tissue degeneration; Altered enzyme activity; Thyroid effects; Additional animal tests have shown: NMP is not carcinogenic when tested by the inhalation, skin, and "under skin" routes of administration on laboratory animals. In oral studies, NMP was not carcinogenic in rats, but produced liver tumors in mice. There was no clear dose-response relationship in the mouse study and the significance of the data is unknown. == NMP was not teratogenic (i.e. did not cause fetal developmental malformations) by skin exposure to laboratory test animals. For inhalation animal testing, NMP showed developmental delays rather than teratogenic effects. The delayed effects involved a reduction in fetal body weight, delay in physical development and limited evidence of deficits in behavioral test. The effects were found to be neither permanent nor life-threatening. == Tests have shown that NMP does not cause genetic damage in bacterial or mammalian cell cultures. It has not been tested in animals for genetic toxicity. ****Human health effects of overexposure may include: BY SKIN CONTACT: Dermatitis; Skin irritation with itching, burning, redness, swelling or rash; BY EYE CONTACT: Eye irritation with discomfort, tearing, or blurring of vision; BY INHALATION: Vapors may cause respiratory tract irritation; May cause nose and throat irritation with sneezing, sore throat or runny nose; Nonspecific discomfort, e.g., nausea, headache or weakness; BY INGESTION: Chills; May cause gastrointestinal tract irritation; Vomiting; Abdominal cramps; BY INHALATION OR INGESTION: Drowsiness; Nausea; Dizziness. Human effects of higher level acute, repeated or chronic overexposure may include: BY SKIN CONTACT: There are inconclusive or unverified reports of human sensitization; Rash; Blisters; Burning; Cracking; Redness; Pain; Severe irritation; Skin permeation may occur in amounts capable of producing the effects of systemic toxicity. ***In addition: No information was found to determine carcinogenic potential of NMP in humans. == One documented human case has attempted to link human stillbirth and occupational NMP exposure. This study

Material Safety Data Sheet

(HAZARDS IDENTIFICATION - Continued)

neither proved nor disproved a causal link between the NMP exposure and the stillbirth. == There are reports that low NMP exposures caused some individuals to experience eye irritation or chronic headache.

>>>Polyamic Acid of Pyromellitic Dianhydride/4,4-Oxydianiline (Polymer)
****Toxic effects described in animals include: BY SKIN OR EYE CONTACT: Slight skin irritation; No skin sensitization; BY INHALATION: Respiratory effects. Toxic effects of repeated or prolonged animal exposures include: BY INGESTION: Lower weight gain; ****Human health effects of overexposure may include: BY SKIN OR EYE CONTACT: Skin irritation with discomfort or rash; BY INHALATION: Irritation of the upper respiratory passages with coughing and discomfort. ***In addition: Significant skin permeation appears unlikely.

>>>Aromatic Hydrocarbon(Petroleum Distillate)
Toxic effects described in animals include: BY SKIN OR EYE CONTACT: Skin photosensitization; Moderate skin irritation; Slight eye irritation; BY INHALATION: Altered respiratory rate; Tremors; Incoordination; Salivation; Hyperactivity; Nonspecific effects, e.g., weight loss and irritation. ****Human health effects of overexposure may include: BY SKIN OR EYE CONTACT: Skin irritation with discomfort or rash; Eye irritation with discomfort, tearing, or blurring of vision; BY INHALATION: Irritation of the upper respiratory passages with coughing and discomfort; BY INGESTION: Temporary nervous system depression with anaesthetic effects, e.g., dizziness, headache, confusion, incoordination, and loss of consciousness; Nonspecific discomfort, e.g., nausea, headache or weakness. ***In addition: Skin contact may cause photosensitization in susceptible individuals.

>>>1,2,4-Trimethylbenzene
Human health effects of overexposure may include: BY SKIN CONTACT: Skin irritation with discomfort or rash; BY EYE CONTACT: Eye irritation with discomfort, tearing, or blurring of vision; BY INHALATION: Temporary nervous system depression with anaesthetic effects, e.g., dizziness, headache, confusion, incoordination, and loss of consciousness; Temporary lung irritation effects with cough, discomfort, difficulty breathing or shortness of breath; Asthma-like reactions with shortness of breath, wheezing, or cough, and possibly occurring on subsequent re-exposure to concentrations below established exposure limits. In addition: BY SKIN CONTACT: There are no reports on human sensitization.

Material Safety Data Sheet

(HAZARDS IDENTIFICATION - Continued)

Carcinogenicity Information

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

FIRST AID MEASURES

First Aid

INHALATION

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

SKIN CONTACT

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician. Wash contaminated clothing before reuse.

EYE CONTACT

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

INGESTION

If swallowed, do not induce vomiting. Immediately give 2 glasses of water. Never give anything by mouth to an unconscious person. Call a physician.

Notes to Physicians

Activated charcoal mixture may be beneficial. Suspend 50 g activated charcoal in 400 mL water and mix well. Administer 5 mL/kg, or 350 mL for an average adult.

FIRE FIGHTING MEASURES

Flammable Properties

Flash Point : 108 F (42 C) Calculated

KEEP AWAY FROM SPARKS AND OPEN FLAMES. Do not smoke in area with open product; If the product may be heated above its flashpoint during processing, remove sources of ignition such as open sparks, flames or static discharge to prevent vapor ignition.

Material Safety Data Sheet

(FIRE FIGHTING MEASURES - Continued)

Extinguishing Media

Sand, Dry Chemical, Carbon Dioxide.

Fire Fighting Instructions

Wear full protective equipment. Wear self-contained breathing apparatus. Thoroughly decontaminate all equipment used in firefighting efforts before returning to service.

Toxic decomposition products may form under fire conditions. (See Decomposition Section.) Dispose of residues per federal, state, and local regulation. (See Waste Disposal Section.).

ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Evacuate personnel, thoroughly ventilate area, use self-contained breathing apparatus.

Initial Containment

Spill, Leak or Release:

FOR SMALL SPILLS, absorb on rags, sand or other absorbant material; FOR LARGE SPILLS, get workers out of affected area. If flammable liquids or vapors may be present, turn off electrical devices or other sources of sparks or flames. WEAR PROTECTIVE EQUIPMENT. Use supplied-air respiratory protection if vapor concentrations are not known; Contain spill at source by diking or absorbing with sand. Do not allow spill to spread to or intentionally flush to sewer or ground. Wash area thoroughly. Adequately ventilate area; Spill residue, cleaning rags and absorbant may be considered hazardous. (See Waste Disposal Section.)

HANDLING AND STORAGE

Handling (Personnel)

Avoid contact with eyes, skin or clothing. Wash thoroughly after handling. Wash clothing after use. Do not store or consume food, drink or tobacco in areas where they may become contaminated with this material.

Material Safety Data Sheet

(HANDLING AND STORAGE - Continued)

Handling (Physical Aspects)

Avoid dust generation.

EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Use only with adequate ventilation.

Personal Protective Equipment

EYE/FACE PROTECTION: Wear safety glasses or coverall chemical splash goggles.

RESPIRATORS: Where there is potential for airborne exposures in excess of applicable limits, wear NIOSH approved respiratory protection.

PROTECTIVE CLOTHING: Where there is potential for skin contact have available and wear as appropriate impervious gloves, apron, pants, and jacket.

Exposure Guidelines

Applicable Exposure Limits

n-Methylpyrrolidone

PEL	(OSHA)	: None Established
TLV	(ACGIH)	: None Established
AEL *	(DuPont)	: 5 ppm, 8 & 12 Hr. TWA, Skin
WEEL	(AIHA)	: 10 ppm, 8 Hr. TWA, Skin

Polyamic Acid of Pyromellitic Dianhydride/ 4,4-Oxydianiline
(Polymer)

PEL	(OSHA)	: None Established
TLV	(ACGIH)	: None Established
AEL *	(DuPont)	: 10 mg/m ³ , 8 & 12 Hr. TWA, total dust 5 mg/m ³ , 8 & 12 Hr. TWA, respirable dust

Aromatic Hydrocarbon(Petroleum Distillate)

PEL	(OSHA)	: None Established
TLV	(ACGIH)	: None Established
AEL *	(DuPont)	: 50 ppm, 8 Hr. TWA

1,2,4-Trimethylbenzene

PEL	(OSHA)	: 25 ppm, 125 mg/m ³ , 8 Hr. TWA
TLV	(ACGIH)	: 25 ppm, 123 mg/m ³ , 8 Hr. TWA
AEL *	(DuPont)	: None Established

* AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

Material Safety Data Sheet

PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

Form : Viscous Liquid.
Color : Amber.
Odor : Mild, Solvent.
Solubility in Water : Insoluble

STABILITY AND REACTIVITY

Chemical Stability

Stable at normal temperatures and recommended storage conditions

Conditions to Avoid

Reducing agents; Oxidizing agents; Bases; Acids; Strong Acids; Strong Oxidizers.

Decomposition

Carbon monoxide (CO); Nitrogen oxides; Carbon dioxide; water; Various hydrocarbons

Polymerization

Polymerization will not occur.

TOXICOLOGICAL INFORMATION

Animal Data

>>>n-Methylpyrrolidone

Inhalation 4 hour ALC [Rats]: 1.7 mg/L
Skin LD50 [Rabbits]: 8000 mg/kg
Oral LD50 [Rats]: 4320 mg/kg.

>>>Polyamic Acid of Pyromellitic

Dianhydride/4,4-Oxydianiline (Polymer)
Inhalation 4 hour LC50: 15,600 mg/m3 in rats.

Aromatic Hydrocarbon (Petroleum Distillate)

Inhalation 6 hour LC50 [Rats]: >14.4 mg/L
Oral LD50 [Rats]: ~5,000 mg/kg.

1,2,4-Trimethylbenzene

Inhalation LC50 4 hour [Rat]: 18,000 mg/m3
(Soviet data)
Skin absorption LD50 [Rabbit]: No data found
Oral LD50 [Rat]: 5,000 mg/kg
(Soviet data).

Material Safety Data Sheet

DISPOSAL CONSIDERATIONS

Waste Disposal

Treatment, storage, transportation, and disposal must be in accordance with applicable Federal, State/Provincial, and Local regulations.

Components of this product may be considered hazardous.

Container Disposal

Contaminated/not cleaned containers should be treated/handled like product waste.

REGULATORY INFORMATION

U.S. Federal Regulations

This product complies with TSCA inventory reporting requirements.

The following ingredients are subject to the reporting requirements of section 313 of Title III of the Superfund Amendment and Reauthorization Act of 1986 and 40 CFR part 372:

INGREDIENT(S)	Weight %
N-Methyl-2-Pyrrolidone	> 60
1,2,4-Trimethyl Benzene,	5- 10%

State Regulations (U.S.)

WARNING - SUBSTANCES KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM-
n-Methylpyrrolidone.

OTHER INFORMATION

Additional Information

This product is a physical mixture. The health effects information about this product is based on the individual ingredients; The data in this Material Safety Data Sheet relates only to the specific product designated herein and does not relate to its use in combination with any other material or in any process.

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

Material Safety Data Sheet

(Continued)

Responsibility for MSDS : HD Microsystems
Address : Cheesequake Road
Parlin, NJ 08859
Telephone : 1-800-346-5656

Indicates updated section.

End of MSDS