

# Material Safety Data Sheet



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## HD-4110

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Revised 01-OCT-2009

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### CHEMICAL PRODUCT/COMPANY IDENTIFICATION

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#### Tradenames and Synonyms

Polyamic Ester

#### Company Identification

##### MANUFACTURER/DISTRIBUTOR

HD MicroSystems  
Cheesequake Road  
Parlin  
New Jersey  
USA  
08859

##### PHONE NUMBERS

Product Information : (800) 346-5656  
Transport Emergency : (800) 424-9300 (Outside the US (703)  
527-3887)  
Medical Emergency : (800) 441-7515 (Outside the US (302)  
774-1000)

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### COMPOSITION/INFORMATION ON INGREDIENTS

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#### Components

Material	CAS Number	%
*n-Methylpyrrolidone	872-50-4	30-60
Esterified polyamic acid resin		30-60
Acrylate Ester		5-10
Proprietary Ingredient(s)		1-5
*Methanol	67-56-1	1-5

\* Disclosure as a toxic chemical is required under Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR part 372.

#### Components (Remarks)

The specific identity of the Esterified Polyamic Acid Resin, and Proprietary Ingredient(s) are withheld as a trade secrets.

## Material Safety Data Sheet

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HAZARDS IDENTIFICATION  
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## Potential Health Effects

This product is a physical mixture. The health effects information about this product is based on the individual ingredients:

OVERVIEW: The most likely routes of 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 (see section titled GLOVES) and washing affected areas immediately if contact occurs. Volatile solvents will start evaporating during room temperature use of the product, such as thinning, pouring from jar to dispensing machine, and spin coating. Mist and solvent vapors will evolve if spray application is used. During wafer drying, 125 - 150 C, and final curing, 350 - 450 C, the remaining solvent(s) will evaporate. Potential overexposure to other chemicals used in the operation such as wafer etchants and cleaners should also be considered. Well designed area and personal air sampling and analysis can show if exposures are within established limits. Properly designed local ventilation and process enclosure are effective ways to limit employee exposure where needed. In addition to meeting exposure limits, it is always prudent to use all practical means to minimize employee exposure to chemicals. A significant difference in overall exposure can be made with practical measures such as:

- \* Inhalation - minimizing by keeping jars of product covered
- \* Eye - avoiding contact by wearing chemical splash goggles where there is splash potential
- \* Ingestion - avoiding by washing hands before eating, drinking or smoking, and restricting these activities to outside the work area.

## &gt;&gt;&gt;N-Methyl-2-Pyrrolidone

\*\*\*\*Toxic effects described in animals include: BY SKIN CONTACT: No skin sensitization; BY INHALATION: Respiration rate changes; 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.

## Material Safety Data Sheet

## (HAZARDS IDENTIFICATION - Continued)

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 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.

## &gt;&gt;&gt;Esterified Polyamic Acid Resin

\*\*\*\*Human health effects of overexposure may include: BY SKIN CONTACT: May cause irritation; BY INHALATION: May cause irritation. \*\*\*\*Human effects of higher level acute, repeated or chronic overexposure may include: BY CONTACT, INHALATION, OR INGESTION: No acceptable information available to confidently predict the effects of excessive human exposure to this compound.

## &gt;&gt;&gt;Acrylate Ester

\*\*\*\*Human health effects of overexposure may include: BY SKIN CONTACT: Moderate irritation; May cause skin sensitization; Blistering; BY EYE CONTACT: Slight irritation; BY INHALATION: Coughing; Shortness of breath; Mucous production; At elevated temperatures, vapors may irritate respiratory tract; BY INGESTION: No known or anticipated toxic effects. \*\*\*\*Human effects of higher level acute, repeated or chronic overexposure may include: BY SKIN CONTACT: Skin permeation may occur in amounts capable of producing the effects of systemic toxicity.

## Material Safety Data Sheet

(HAZARDS IDENTIFICATION - Continued)

## &gt;&gt;&gt;Proprietary Ingredient(s)

The toxicological properties of this material have not been fully evaluated. However, it has a low order of acute toxicity. The solid may cause irritation of the skin, eyes and respiratory tract.

## &gt;&gt;&gt;Methanol

\*\*\*\*Additional animal tests have shown: Has not been tested for its ability to cause permanent genetic damage in reproductive cells of mammals; Animal tests demonstrate developmental toxicity; No genetic damage in animals, bacterial or mammalian cell cultures; No animal data available to define reproductive toxicity; No animal data available to define carcinogenicity. \*\*\*\*Human health effects of overexposure may include: BY SKIN CONTACT: Skin permeation may occur in amounts capable of producing effects of systemic toxicity; Skin irritation with itching, burning, redness, swelling or rash; BY EYE CONTACT: Eye irritation with discomfort, tearing, or blurring of vision; BY INHALATION: Irritation of mouth causing coughing, wheezing, headaches, nausea and vomiting; Sore throat; Irritation of the nose and throat; Sneezing; Runny nose; BY INGESTION: May cause digestive tract irritation with stomach pain, heartburn, nausea, vomiting or diarrhea; BY CONTACT, INHALATION, OR INGESTION: Central nervous system depression with dizziness, confusion, incoordination, drowsiness, or unconsciousness; Nonspecific discomfort, e.g., nausea, headache or weakness. \*\*\*\*Human effects of higher level acute, repeated or chronic overexposure may include: BY CONTACT, INHALATION, OR INGESTION: Kidney damage; Heartburn; Liver damage; Nerve damage with numbness, weakness or muscle rigidity; Fatality can result from gross overexposure. \*\*\*In addition: If metabolic acidosis occurs, visual disturbance, including blindness, may follow; Animal tests have shown teratogenic effects so, this substance may be a teratogen in humans. A teratogen is a substance that may cause physical defects in the developing embryo or fetus when a pregnant female is exposed to that substance. Odor threshold for this substance is 100 parts per million.

## 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.

## Material Safety Data Sheet

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FIRST AID MEASURES  
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## 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.

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FIRE FIGHTING MEASURES  
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## Flammable Properties

Flash Point : Not Available

## FIRE &amp; EXPLOSION HAZARDS:

The product is not an unusual fire or explosion hazard.

## Extinguishing Media

Dry Chemical, Carbon Dioxide, Sand.

## Fire Fighting Instructions

Wear full protective equipment. Thoroughly decontaminate all equipment used in firefighting efforts before returning to service.

## Material Safety Data Sheet

## (FIRE FIGHTING MEASURES - Continued)

Toxic decomposition products may form under fire conditions. (See Decomposition Section.); Wear a full facepiece, positive pressure, self-contained breathing apparatus (SCBA); Dispose of residues per federal, state, and local regulation. (See Waste Disposal Section.).

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ACCIDENTAL RELEASE MEASURES  
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## 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.

## Spill Clean Up

Spill, Leak or Release:

FOR SMALL SPILLS, absorb on rags, sand or other absorbent 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 absorbent may be considered hazardous. (See Waste Disposal Section.).

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HANDLING AND STORAGE  
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## Handling (Personnel)

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

Contaminated clothing and cleaning materials, etc. should be considered hazardous until decontaminated or properly disposed of. (See Waste Disposal Section.).

## Handling (Physical Aspects)

Avoid dust generation. Keep container tightly closed.

## Material Safety Data Sheet

(HANDLING AND STORAGE - Continued)

Contains photoreactive chemicals. Open and use under yellow light.

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EXPOSURE CONTROLS/PERSONAL PROTECTION  
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## Engineering Controls

Use only with adequate ventilation.

Adequate local ventilation should be used to keep exposures below applicable limits; Other engineering controls such as totally enclosed handling systems are also preferred; Respiratory protection will be needed if exposures can not be kept below applicable limits by other means.

## Personal Protective Equipment

## Respiratory Protection:

If respirators are needed to meet applicable limits, a respiratory protection program up to the level of OSHA Standard 29 CFR 1910.134 is mandatory. This includes air monitoring, selection, medical approval, training, fit testing, inspection, maintenance, cleaning, storage, etc.. Selection of a suitable respirator will depend on the properties of the contaminant(s) and their actual or expected air concentration(s) versus applicable limits. Consult ANSI Standard Z88.2 for decision logic to select appropriate NIOSH/MESA approved respirators;

## Gloves:

Gloves should be used when the possibility of skin contact exists; The suitability of a particular glove and glove material should be determined as part of an overall glove program. Considerations may include chemical breakthrough time; permeation rate; abrasion, cut and puncture resistance; flexibility; duration of contact; etc.

## Other Protection Practices:

Appropriate eye protection such as chemical splash goggles should be used if the possibility of eye contact exists; Protective outer clothing should be used where the possibility of body contact exists. Additional engineering controls, work practices and training may be required depending on exposure levels. These are discussed in the OSHA Respiratory Protection Standard (29 CFR 1910.134) and OSHA Hazard Communication Standard (29 CFR 1910.1200).

## Exposure Guidelines

## Material Safety Data Sheet

## 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

## Methanol

PEL (OSHA) : 200 ppm, 260 mg/m<sup>3</sup>, 8 Hr. TWA  
TLV (ACGIH) : 200 ppm, 8 Hr. TWA, Skin  
STEL 250 ppm  
AEL \* (DuPont) : 200 ppm, 8 & 12 Hr. TWA, Skin

\* 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.

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PHYSICAL AND CHEMICAL PROPERTIES  
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## Physical Data

Form : Viscous Liquid.  
Color : Amber.  
Solubility in Water : Slight  
Odor : Aromatic.

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STABILITY AND REACTIVITY  
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## Chemical Stability

Stable at normal temperatures and recommended storage conditions

## Conditions to Avoid

Reducing agents; Oxidizing agents; Bases; Acids; Strong Acids; Strong Oxidizers; Inert gases; Direct Sunlight.

## Incompatibility with Other Materials

Reducing agents; Oxidizing agents; Bases; Acids; Strong Acids; Strong Oxidizers; Inert gases; Direct Sunlight.

## Decomposition

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

## Polymerization

This material will not violently polymerize or give off heat under normal storage conditions or when being used as a photoresist. The material may slowly polymerize if nitrogen inerted or heated.

## Material Safety Data Sheet

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TOXICOLOGICAL INFORMATION  
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## Animal Data

## &gt;&gt;&gt;N-Methyl-2-Pyrrollidone

Inhalation 4 hour ALC: 1.7 mg/L in rats (Moderately toxic)

Skin absorption LD50: &gt; 8,000 mg/kg in rabbits (Slightly toxic)

Oral LD50: 4,320 mg/kg (Slightly toxic).

## &gt;&gt;&gt;Acrylate Ester

No information found.

## &gt;&gt;&gt;Esterified Polyamic Acid Resin

No information found.

## &gt;&gt;&gt;Proprietary Ingredient(s)

ORAL LD50 [mouse]: &gt;1000 mg/kg

DERMAL LD50 [rat]: &gt; 500 mg/kg.

## &gt;&gt;&gt;Methanol

Inhalation 1 hour LC50 [Rats]: &gt; 145,000 ppm

Oral LD50 [Rats]: 9,100 mg/kg

Skin LD50 [Rabbits]: 15,840 mg/kg.

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ECOLOGICAL INFORMATION  
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## Ecotoxicological Information

No information is available.

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DISPOSAL CONSIDERATIONS  
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## Waste Disposal

Components of this product may be considered hazardous;  
Consult applicable Federal, State, and local  
regulations for allowable disposal methods.

## Container Disposal

Empty product containers should be considered hazardous  
until decontaminated or properly disposed of. (See Waste  
Disposal Section.).

## Material Safety Data Sheet

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TRANSPORTATION INFORMATION  
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## # Shipping Information

This product is shipped using ECCN code EAR99.

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REGULATORY INFORMATION  
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## U.S. Federal Regulations

This product complies with TSCA inventory reporting requirements.

## State Regulations (U.S.)

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

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OTHER INFORMATION  
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## NFPA, NPCA-HMIS

No information available.

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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.

Responsibility for MSDS : HD MicroSystems(TM)  
Address : Chesapeake Road  
Parlin, NJ  
Telephone : 800-346-5656

# Indicates updated section.

End of MSDS

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