HD MicroSystems™
An Enterprise of Hitachi Chemical and DuPont Electronics

MATERIAL SAFETY DATA SHEET

***** IDENTIFICATION *****

NAME: PI2733 SYNONYMS: POLYIMIDE COATING.
CHEM.FAMILY: Pyralin® Polyimide Coating. FORMULA: Proprietary.

MANUFACTURER:
HD MicroSystems™
Cheesequake Road
Parlin, NJ 08859

INFORMATION & EMERGENCY TELEPHONE NOS:
INFORMATION: Product: (800) 441-7515
EMERGENCIES: Medical: (800) 441-3637
Transport (CHEMTREC): (800) 424-9300

All Ingredients in This Product are TSCA Listed/Reported.

***** PHYSICAL DATA *****

FORM: Viscous Liquid. ODOR: Sweet Aromatic.

APPEARANCE: Brown. SOLUBILITY IN WATER: Slight.

***** COMPONENTS *****

Material(s):	CAS#	V.P. mm Hg @ 20C	Weight %
N-Methyl-2-Pyrollidone.	872-50-4	< 1.	30 - 60%
Tetraethylene Glycol Diacrylate.	17831-71-9	< 0.001	5 - 10%
Photosensitive Polyimide Resin.			30 - 60%
Proprietary Ingredient(s).			1 - 5%

***** HAZARDOUS REACTIVITY *****

INSTABILITY:
The product is normally stable.

INCOMPATIBILITY:
Avoid contact with:
Acids; Bases; Oxidizing agents; Oxygen; Free radical initiators; Strong acids; Strong oxidizers; Peroxides; Strong reducing agents; Strong oxidizing agents; Strong alkalies; Inert gases; Direct sunlight.

DECOMPOSITION:

Decomposition products:
Carbon Dioxide (CO_2); Various hydrocarbons; Carbon Monoxide (CO); Water; Alcohols; Silicon oxides; Nitrogen oxides.

POLYMERIZATION:
The product does not normally polymerize significantly.

***** FIRE & EXPLOSION DATA *****

FLASHPOINT: 140 F Seta CC

FIRE & EXPLOSION HAZARDS:
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.

EXTINGUISHING MEDIA:
Water spray, dry chemical or carbon dioxide.

SPECIAL FIREFIGHTING INFORMATION:
Toxic decomposition products may form under fire conditions. (See Decomposition Section.);
Wear full protective clothing and a full facepiece, positive pressure, self-contained breathing apparatus (SCBA);
Decontaminate contaminated clothing and equipment with soap and water. Dispose of residues per federal, state, and local regulation. (See Waste Disposal Section.).

***** HEALTH HAZARD INFORMATION *****

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.

PRINCIPAL HEALTH EFFECTS:

>>>N-Methyl-2-Pyrollidone
****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. 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.

>>>Tetraethylene Glycol Diacrylate
****Toxic effects described in animals include: BY SKIN OR EYE CONTACT: Skin sensitization; Moderate skin irritation; Corrosive to the eye. Toxic effects of repeated or prolonged animal exposures include: BY SKIN OR EYE CONTACT: Corrosive to the skin; Toxic effects of chronic animal tests include: BY SKIN OR EYE CONTACT: Corrosive to skin; ****Additional animal tests have shown: Carcinogenic toxicity; Genetic damage in mammalian cell cultures; No genetic damage in bacterial cell cultures; No developmental toxicity. ****Human health effects of overexposure may include: BY SKIN OR EYE CONTACT: Skin irritation with discomfort or rash; Allergic skin rashes; Eye irritation with discomfort, tearing, or blurring of vision; BY INHALATION: Irritation of lungs. ****Human effects of higher level acute, repeated or chronic

overexposure may include: BY SKIN OR EYE CONTACT: Skin burns or ulceration; Eye corrosion with corneal or conjunctival ulceration. ***In addition: Skin sensitization may be caused in susceptible humans; The chemical is a weak carcinogen on the skin of mice.

>>>Photosensitive Polyimide Resin
****Toxic effects described in animals include: Skin irritation; Moderate to severe eye irritation.

>>>Proprietary Ingredient(s)
****Toxic effects described in animals include: Skin irritation; Eye irritation; Upper respiratory irritation.

>>>Proprietary Ingredient(s)
****Human health effects of overexposure may include: BY SKIN OR EYE CONTACT: Allergic skin rashes; Nuisance particulate may cause eye irritation; BY INHALATION: Irritation of the upper respiratory passages; Irritation of the nose and throat; BY INGESTION: Headache; Nausea; Irritation of digestive tract; Diarrhea; Vomiting. ****Human effects of higher level acute, repeated or chronic overexposure may include: BY SKIN OR EYE CONTACT: Skin permeation may occur in amounts capable of producing the effects of systemic toxicity.

>>>Proprietary Ingredient(s)
****Human health effects of overexposure may include: BY CONTACT, INHALATION, OR INGESTION: No acceptable information to confidently predict effects of excessive human exposure. ****Human effects of higher level acute, repeated or chronic overexposure may include: BY CONTACT, INHALATION, OR INGESTION: To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated; No acceptable information to confidently predict effects of chronic human exposure.

Individuals may have increased susceptibility to the hazards of overexposure to ingredient(s) of this product if they have pre-existing diseases of the:
Skin; Eyes.

ANIMAL DATA:

>>>N-Methyl-2-Pyrollidone
Inhalation 4 hour ALC [Rats]: 1.7 mg/L
Oral LD50 [Rats]: 4,320 mg/kg

Skin absorption LD50 [Rabbits]: 8,000 mg/kg.

>>>Tetraethylene Glycol Diacrylate
Skin absorption LD50: > 3,000 mg/kg in rabbits
Oral LD50: 813.2 mg/kg in rats.

>>>Photosensitive Polyimide Resin
ORAL ALD (Approximate Lethal Dose) (RAT): 1900 mg/kg.

>>>Proprietary Ingredient(s)
No information available.

>>>Proprietary Ingredient(s)
Acute Toxicity LD50 [ivn-mouse]: 180 mg/kg.

>>>Proprietary Ingredient(s)
No applicable information found.

CARCINOGENICITY LISTING:

No ingredients of this product are designated by IARC, NTP, OSHA, ACGIH or Dupont as potential carcinogens.

EXPOSURE LIMITS:
Workplace exposures should be kept below the following limits:

.	AIHA		ACGIH		OSHA	
Name/Units	8hr	15min	8hr	15min	8hr	15min
N-METHYL-2-PYRROLIDONE						
Units: ppm	10	(S)				
TETRAETHYLENE GLYCOL DIACRYLATE						
Units: mg/m3	1					

Also, DuPont has established and observes the following limits:

Name/Units	12 hr	8hr	15min	Ceiling
N-METHYL-2-PYRROLIDONE				
Units: ppm	5	5		(S)
TETRAETHYLENE GLYCOL DIACRYLATE				
Units: mg/m3	0.5	0.5		

NOTES ON EXPOSURE LIMITS:
PELs - OSHA Permissible Exposure Limits - 29 CFR 1910.1000, Subpart Z, or specific substance standards;
TLVs - ACGIH Threshold Limit Values - published by American Conference of Governmental Industrial Hygienists, 6500 Glenway Avenue, Cincinnati, OH 45211;

WEELs- AIHA Workplace Environmental Exposure Limits - published by the American Industrial Hygiene Association, 2700 Prosperity Avenue, Suite 250, Fairfax, VA 22031;
AELs - Dupont Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits are lower than AEL in effect, government limits shall take precedence;
(C) = "ceiling", limit not to be exceeded for any time period;
(S) = "skin" , skin absorption may contribute significantly to the ingredient's internal toxicity.

***** FIRST AID INSTRUCTIONS *****

Skin Contact: For skin 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: For eye contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

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

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

NOTES TO PHYSICIAN: Activated charcoal slurry may be administered. To prepare activated charcoal slurry, suspend 50 grams activated charcoal in 400ml water and mix thoroughly. Administer 5ml/kg, or 350ml for an average adult.

***** PROTECTION INFORMATION *****

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/MSHA 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. Contaminated work clothing should not be allowed out of the workplace;
Do not smoke, consume or store food or drinks in areas where the product is handled or stored. After handling the product, wash hands thoroughly before leaving the work area;
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);
Do not breath dust. Avoid contact with eyes, skin, or clothing. Wash thoroughly after handling.

***** DISPOSAL INFORMATION *****

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.).

Waste Disposal:

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

***** PRODUCT INFORMATION *****

Contains photoreactive chemicals. Open and use under yellow light.

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

***** ADDITIONAL INFORMATION *****

SPECIAL NOTES:

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	30 - 60%

DENSITY = 1.20 g/L

CALIFORNIA PROPOSITION 65: WARNING: This product does not contain chemical known to the state of California to cause cancer, birth defects, or other reproductive harm.

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.

Date of latest MSDS revision: 08/16/00

Person Responsible for MSDS:

Safety Coordinator - MSDS
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