



## MATERIAL SAFETY DATA SHEET

### \*\*\*\*\* IDENTIFICATION \*\*\*\*\*

NAME: T9039  
CHEM.FAMILY: Mixture.

SYNONYMS: PYRALIN THINNER.

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: Liquid.

ODOR: Aromatic.

APPEARANCE: Colorless to Amber. SOLUBILITY IN WATER: Slight.

### \*\*\*\*\* COMPONENTS \*\*\*\*\*

Material(s):	CAS#	V.P. mm Hg @ 20C	Weight %
1-Methoxy-2-Propanol.	107-98-2	11.	30 - 60%
N-Methyl-2-Pyrrolidone.	872-50-4	0.29	30 - 60%

T9039/AH1  
05/29/98

\*\*\*\*\* HAZARDOUS REACTIVITY \*\*\*\*\*

INSTABILITY:

The product is normally stable.

INCOMPATIBILITY:

Avoid contact with:

Reducing agents; Oxidizing agents; Bases; Acids; Strong acids;  
Strong oxidizers.

DECOMPOSITION:

Decomposition products:

Carbon monoxide (CO); Carbon monoxide, carbon dioxide, water;  
Nitrogen oxides.

POLYMERIZATION:

The product does not normally polymerize significantly.

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

FLASHPOINT: 130F Calculated

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:

##### >>>1-Methoxy-2-Propanol

\*\*\*\*Toxic effects described in animals include: BY SKIN OR EYE CONTACT: Slight skin irritation; Eye irritation; Central nervous system effects; BY INHALATION: Central nervous system effects; Liver effects; Lung effects. Toxic effects of repeated or prolonged animal exposures include: BY SKIN OR EYE CONTACT: Kidney effects; Death; BY INHALATION: Central nervous system effects; Lower weight gain; Liver effects; Kidney effects; BY INGESTION: Weight loss; Central nervous system effects; Kidney effects; Liver effects; \*\*\*\*Additional animal tests have shown: Developmental toxicity at dosage levels showing maternal toxicity; No reproductive toxicity. \*\*\*\*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. \*\*\*In addition: BY SKIN OR EYE CONTACT: Skin permeation can occur in amounts capable of producing effects of systemic toxicity.

>>>N-Methyl-2-Pyrrolidone

\*\*\*\*Toxic effects described in animals include: BY SKIN OR EYE CONTACT: Mild skin irritation; No skin sensitization; BY INHALATION: Respiratory effects. Toxic effects of repeated or prolonged animal exposures include: BY INHALATION: Respiratory effects; Bone marrow effects; Lymph system effects; Testicular effects; \*\*\*\*Additional animal tests have shown: No carcinogenic activity; No developmental toxicity; No genetic damage in bacterial or mammalian cell cultures; No reproductive toxicity. \*\*\*\*Human health effects of overexposure may include: By contact with liquid or vapor: Eye irritation with discomfort, tearing, or blurring of vision; BY SKIN OR EYE CONTACT: Eye irritation with discomfort, tearing, or blurring of vision; Skin irritation with itching, burning, redness, swelling or rash; BY INHALATION: Runny nose; Sore throat; Sneezing; Irritation of the nose and throat; Nonspecific discomfort, e.g., nausea, headache or weakness. \*\*\*\*Human effects of higher level acute, repeated or chronic overexposure may include: BY SKIN OR EYE CONTACT: Skin reddening; Skin irritation with discomfort or rash; Dermatitis; Swelling; Burning. \*\*\*In addition: BY SKIN OR EYE CONTACT: There are inconclusive or unverified reports of human sensitization.

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

Central nervous system; Liver.

ANIMAL DATA:

>>>1-Methoxy-2-Propanol

Inhalation 4 hour LC50: 15,000 ppm in rats  
Skin absorption LD50: 14,000 mg/kg in rabbits  
Oral LD50: 5,200 mg/kg in rats.

>>>N-Methyl-2-Pyrrolidone

Inhalation 4 hour ALC: 1.7 mg/L in rats (Moderately toxic)  
Skin absorption LD50: > 8,000 mg/kg in rabbits  
(Slightly toxic)  
Oral LD50: 4,320 mg/kg (Slightly toxic).

#### 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:

Name/Units	AIHA		ACGIH		OSHA	
	8hr	15min	8hr	15min	8hr	15min
N-METHYL-2-PYRROLIDONE						
Units: ppm		10				
PROPYLENE GLYCOL MONOMETHYL ETHER						
Units: ppm			100	150	100	150

Also, DuPont has established and observes the following limits:

Name/Units	12 hr	8hr	15min	Ceiling
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N-METHYL-2-PYRROLIDONE

Units: ppm		25		
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#### 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 wash skin with soap and water. 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. 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:

A NIOSH/MSHA approved full-face mask equipped with chemical cartridges approved for methylamine may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air purifying respirators is limited. Use a positive pressure air supplied respirator if there is any potential for an uncontrolled release, when exposure levels are not known, or in any other circumstances where air purifying respirators may not provide adequate protection;

For most conditions, no respiratory protection should be needed; however, if handling at elevated temperatures without sufficient ventilation, use an approved air-purifying respirator. In dusty atmospheres, use an approved dust respirator;

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;

A NIOSH/MSHA/OSHA approved air purifying respiratory with a dust/mist cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed limits. Protection provided by air purifying respirators is limited. Use a positive pressure air supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known or any other circumstances where air purifying respirators may not provide adequate protection;

Use a positive pressure air-supplied respirator if concentrations may exceed exposure limits. Air-purifying respirators are inadequate for this material;

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; An OSHA/NIOSH respirator for protection against Nuisance Dust is recommended.

**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 \*\*\*\*\***

**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.).

**Storage:**

Store product below 90F to ensure product viscosity  
stability.

**\*\*\*\*\* ADDITIONAL INFORMATION \*\*\*\*\***

The following ingredients are subject to the reporting require-  
ments 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 =	g/L	VOC =	g/L	wt %
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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.

Canadian WHMIS Classification:  
Class B, Div 3; D2B.



Date of latest MSDS revision: 05/29/98

Person Responsible for MSDS:

Safety Coordinator - MSDS  
DuPont P&EM / MCM  
14 Alexander Drive  
Research Triangle Park, NC 27709-4425  
Telephone: (800) 284-3382  
Outside U.S.: (919) 248-5775


**HD Microsystems™**

An Enterprise of Hitachi Chemical and DuPont Electronics

## Pyralin® Polyimide Coatings for Electronics

# Technical Data Sheet for T-9039 Thinner

### Product Description

T-9039 is a highly purified thinner, filtered through a 0.2 absolute filter and controlled to less than 1 ppm sodium. It is designed to provide excellent processing properties without unusual handling problems.

### Typical Use

T-9039 thinner is used to reduce viscosity and solids content of PYRALIN solutions to obtain desired film thickness. For example, diluting 1 part PI2555 with 2 parts T-9039 yields 1500Å films on a 3" silicon wafer spun at 5000 rpm.

The thinned solution should be allowed to age 12 hours at 70 F before use. This time is needed for the solution to reach equilibrium conditions. T-9039 does not need to be stored in a refrigerator, but mixed solutions should be stored in a refrigerator after the initial 12 hour room temperature aging period.

T-9039 is hygroscopic so it is critical that mixed solutions be brought to room temperature before opening the container, to avoid moisture and condensation. Moisture can attack and degrade the polyamic acid polymer in the PYRALIN formulations.

### Product Specifications

Test	T-9039	Test Method
Density (g/cm <sup>3</sup> )	0.97 ± 0.10	L1111
Solvent System (% by weight)	N-Methyl-2-Pyrrolidone/ Methoxy Propanol 80/20 ±5	L1120
Chloride Content* (ppm max)	4.0	L1058
Sodium Content* (ppm max)	0.5	L1900
Potassium Content* (ppm max)	0.3	
Iron* (ppm max)	0.3	
Copper* (ppm max)	0.3	
Filtration	0.2 micron absolute	

\*Determined on total sample

## Toxicity/Health Hazards

Adequate ventilation must be provided and skin contact should be avoided. Exposed areas should be flushed with water immediately.

Rubber gloves resistant to solvents in PYRALIN® polyimide coatings can be procured as follows: for general-purpose use, the "Buta-Sol" milled butyl rubber glove (Norton Company, Safety Products Division, P.O. Box 4367, Charleston, SC 29405); for light service, the "Wil-Gard" No. 26-640 tan latex industrial glove (Edmont-Wilson Division, Becton Dickinson and Company, 1300 Walnut Street, Coshocton, OH 43812); and for service requiring greater resistance to wear, Natural Latex Rubber glove No. 2911 (B.F. Goodrich Engineered Systems, 500 S. Main Street, Akron, OH 44318).

Data supplied by the General Aniline and Film Corporation indicate that animals exposed to air saturated with N-methyl-2-pyrrolidone for six hours daily for ten days tolerated the conditions of the experiment and gained weight normally. Other animals subjected to 20-day dermal toxicity studies had no specific degenerative changes and did not have a remarkable degree of skin irritation.

Note that this material also contains 1-methoxy-2-propanol.

## Availability

Available in 500 and 1000 g containers from DuPont at the addresses given below:

### United States

**HD Micro Systems Ltd.**  
P.O. Box 80010  
Wilmington, DE 19880-0010  
800-346-5656 (Phone)  
302-892-0597 (Fax)

**HD Micro Systems Ltd.**  
1333 Lawrence Expressway  
Suite 212  
Santa Clara, CA 95051  
408-260-0888 (Phone)  
408-260-0888 (Fax)

### Japan

**HD Micro Systems Ltd.**  
10-13 Shibuya-chome,  
Shibuya-ku,  
Tokyo 150  
Japan  
81-3-3407-9003 (Phone)  
81-3-3407-9037 (Fax)

### Internet

[www.hdmicrosystems.com](http://www.hdmicrosystems.com)

### Europe

**DuPont de Nemours (Deutschland) GmbH**  
P&EM/MCM  
DuPont Strassel  
61352 Bad Homburg, Germany  
49-6172-87-1822 (Phone)  
49-6172-87-1888 (Fax)

**Hitachi Chemical Europe GmbH**  
Immermannstr. 65C  
D-40211 Düsseldorf, Germany  
49-211-166-7300 (Phone)  
49-211-161-6363 (Fax)

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Caution: Do not use in medical applications involving permanent implantation in the human body.



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