



MATERIAL SAFETY DATA SHEET

***** IDENTIFICATION *****

NAME: PI2560 SYNONYMS: POLYIMIDE COATING.
CHEM.FAMILY: Pyralin® Polyimide FORMULA: Proprietary.
Coating.

MANUFACTURER: INFORMATION & EMERGENCY TELEPHONE NOS:
HD Microsystems™ INFORMATION: Product: (800) 441-7515
Cheesequake Road EMERGENCIES: Medical: (800) 441-3637
Parlin, NJ 08859 Transport (CHEMTREC): (800) 424-9300

All Ingredients in This Product Are TSCA Listed/Reported.

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

FORM: Viscous Liquid. ODOR: Aromatic.
APPEARANCE: Colorless to Amber. SOLUBILITY IN WATER: Slight.

***** COMPONENTS *****

| Material(s): | CAS# | V.P. mm Hg @ 20C | Weight % |
|---|------------|------------------|----------|
| Xylene. | 1330-20-7 | 8. | 10 - 30% |
| N-Methyl-2-Pyrrolidone. | 872-50-4 | 0.29 | 30 - 60% |
| Partial Ester of Benzophenone | 31942-21-9 | | 30 - 60% |
| Tetracarboxylic Dianhydride/ 4, 4-Oxydianiline/ m-Phenylenediamine (Polymer). | | | |

PI2560/AH1
05/19/98

***** 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:

>>>Xylene

****Additional animal tests have shown: No reproductive toxicity; No genetic damage in animals, bacterial or mammalian cell cultures; No heritable genetic damage.

****Human health effects of overexposure may include: BY SKIN CONTACT: Skin irritation with itching, burning, redness, swelling or rash; BY EYE CONTACT: Eye irritation with discomfort, tearing, or blurring of vision; BY INHALATION: Runny nose; Sore throat; Sneezing; Irritation of the nose and throat; Central nervous system depression with dizziness, confusion, incoordination, drowsiness, or unconsciousness; Nonspecific discomfort, e.g., nausea, headache or weakness;

unverified reports of human sensitization.

>>>Partial Ester of Benzophenone Tetracarboxylic Dianhydride/
4,4-Oxydianiline/ m-Phenylenediamine (Polymer)

****Toxic effects described in animals include: BY SKIN OR
EYE CONTACT: Skin irritation; Skin sensitization; Eye
irritation.

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; Cardiovascular system; Bone marrow;
Lungs; Liver; Kidneys.

ANIMAL DATA:

>>>Xylene

Inhalation 4 hour LC50: 6,700 ppm in rats (moderately toxic)

Skin absorption LD50: 4,320 mg/kg in rabbits (slightly toxic)

Oral ALD: 4,500 mg/kg in rats (very low toxicity).

>>>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 |
| XYLENE (MIXED ISOMERS) | | | | | | |
| Units: ppm | | | 100 | 150 | 100 | |
| N-METHYL-2-PYRROLIDONE | | | | | | |
| Units: ppm | 10 | | | | | |

***** 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.

Respirators with organic vapor cartridges provide adequate protection, within use limitations, for the following components in this product:

Xylene;

***** 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 in a refrigerated location (0-4F), away from sunlight or ultraviolet light to ensure product viscosity stability.

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

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 % |
|------------------------|----------|
| Xylene, 1330-20-7 | 10 - 30% |
| N-Methyl-2-Pyrrolidone | 30 - 60% |

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: 05/19/98

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

***** 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 at high temperature may include:

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

POLYMERIZATION:

The product may polymerize endothermically if exposed to temperatures over 90 F, ultraviolet light or free radical initiators. This may increase viscosity.

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

FLASHPOINT: 102F 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.).

BY INGESTION: Irritation of gastrointestinal tract; Vomiting; Nausea; Central nervous system depression with dizziness, confusion, incoordination, drowsiness, or unconsciousness; Heartburn; Diarrhea; Stomach pain; Nonspecific discomfort, e.g., nausea, headache or weakness. ****Human effects of higher level acute, repeated or chronic overexposure may include: BY SKIN CONTACT: Skin irritation with discomfort or rash; Defatting (drying) of the skin; Skin permeation may occur in amounts capable of producing the effects of systemic toxicity; BY INHALATION: Cardiovascular effects; Pathological changes in the kidneys; Pathological changes in the liver; Blood chemistry effects; Anemia; Fatality from gross overexposure. ***In addition: BY SKIN CONTACT: This compound has been infrequently associated with skin sensitization in humans; One published report's limited data suggested high oral doses of xylene caused increased malignant tumors in rats. However, other, more extensive studies have demonstrated no carcinogenic activity; BY INGESTION: Major ingestion hazard is aspiration which may result in "chemical pneumonia". Symptoms include coughing, gasping, choking, shortness of breath, bluish discoloration of the skin, rapid breathing and heart rate, and fever. Pulmonary edema or bleeding, drowsiness, confusion, coma and seizures may occur in more serious cases. Symptoms may be delayed for up to 24 hours.

>>>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

Also, DuPont has established and observes the following limits:

| Name/Units | 12 hr | 8hr | 15min | Ceiling |
|------------------------|-------|-----|-------|---------|
| XYLENE (MIXED ISOMERS) | | | | |
| Units: ppm | 100 | 100 | 150 | |
| N-METHYL-2-PYRROLIDONE | | | | |
| Units: ppm | | 25 | | |

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. 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.

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.