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M A T E R I A L S A F E T Y D A T A S H E E T

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***** IDENTIFICATION *****

E X P E R I M E N T A L M A T E R I A L

NAME: HD4012

SYNONYMS:

REF : HD4012

CHEM.FAMILY: Mixture.

FORMULA: Proprietary.

MANUFACTURER:

HD Microsystems [TM]
Rt 141 & Lancaster Pike
BMP 10-2361
Wilmington, DE 19889

INFORMATION & EMERGENCY TELEPHONE NOS:

INFORMATION: Product: (800)441-7515
EMERGENCIES: Medical: (800)441-3637
Transportation (CHEMTREC): (800)424-9300

All Ingredients in This Product are TSCA Listed/Reported.

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

FORM: Liquid.

ODOR: Aromatic.

APPEARANCE: Amber.

SOLUBILITY IN WATER: Unknown.

***** HAZARDOUS COMPONENTS *****

Ingredient(s):	CAS#	V.P. mm Hg @ 20C	Weight %
Methanol.	67-56-1	92.	1 - 5%
N-Methyl-2-Pyrrolidone.	872-50-4	< 1.	30 - 60%
Acrylate Ester.			10 - 30%
Photosensitive Polyimide Resin.			30 - 60%
Proprietary Ingredient(s).			1 - 5%

HD4012XC
05/15/02

/SH1/HDM

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

INSTABILITY:

The product is normally stable.

INCOMPATIBILITY:

Avoid contact with: Acids; Bases; Oxidizing agents; Reducing agents; Free radical inhibitors; Chloroform in the presence of a strong base; Magnesium; Sulfuric acid; Oxygen; Bromine; Nitric acid; Free radical initiators; Alcohols; Light; Heat; Metals; Strong bases; Strong acids; Strong oxidizers; Peroxides; Strong reducing agents; Strong oxidizing agents; Perchloric acid; Strong alkalis; Inert gases; Chromic anhydride.

DECOMPOSITION:

Decomposition products: Carbon Dioxide (CO₂); Various hydrocarbons; Carbon Monoxide (CO); Formaldehyde; Water; Nitrogen oxides; Silicon oxides.

POLYMERIZATION:

Polymerization will not occur.

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

FLASHPOINT: 190 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:

Sand, 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 *****

PRINCIPAL HEALTH EFFECTS:

>>>Methanol

****Additional animal tests have shown: Negative mutagenic effects; Pregnant mice and rats that were exposed to high concentrations of methanol showed physical defects in the developing embryo or fetus; the concentration levels were not toxic to the mother. On this basis, methanol shall be considered a possible human developmental toxin; consult the Exposure Limits Table below for the limits established to protect against the potential adverse effects of methanol; Has not been tested for its ability to cause permanent genetic damage in reproductive cells of mammals; 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; Sneezing; Sore throat; Runny nose; Irritation of the nose and throat; 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; Visual impairment; May cause blindness; 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: Symptoms to methanol (MeOH) overexposure may be delayed. Also, people whose body chemistries are folate-deficient may increase susceptibility to MeOH toxicity. Pregnant and lactating women, and persons with chronic alcoholism are among those with an increased risk of folate-deficiency, and hence have an increased susceptibility to the toxic effects of MeOH. Folate deficiency during pregnancy is associated with an increased risk of neural tube defects; poor folate status may also be a risk factor for coronary disease. MeOH odor threshold reported as 100 parts per million.

>>>N-Methyl-2-Pyrrolidone

****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 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.

>>>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.

>>>Photosensitive Polyimide 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.

>>>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)

****Toxic effects described in animals include: BY SKIN OR EYE CONTACT: Mild skin irritation; Mild eye irritation; No skin sensitization; BY INHALATION: Upper respiratory irritation. ****Additional animal tests have shown: No mutagenic toxicity.

>>>Proprietary Ingredient(s)

****Toxic effects described in animals include: Skin irritation; Eye irritation. ****Human health effects of overexposure may include: BY CONTACT, INHALATION, OR INGESTION: No acceptable information to confidently predict effects of excessive human exposure.

>>>Proprietary Ingredient(s)

****Human health effects of overexposure may include: BY CONTACT, INHALATION, OR INGESTION: No known or anticipated toxic effects.

Individuals may have increased susceptibility to the hazards of overexposure to ingredient(s) of this product if they have preexisting diseases of the: Skin; Central nervous system; Eyes; Cardiovascular system; Liver; Kidneys.

ANIMAL DATA:

>>>Methanol

Inhalation LC50 1 hour [Rat]: >145,000 ppm
Skin absorption LD50 [Rabbit]: 15,840 mg/kg
Oral LD50 [Rat]: 9,100 mg/kg.

>>>N-Methyl-2-Pyrrolidone

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

>>>Acrylate Ester

No information found.

>>>Photosensitive Polyimide Resin

No information found.

>>>Proprietary Ingredient(s)

Acute Toxicity LD50 [ivn-mouse]: 180 mg/kg.

>>>Proprietary Ingredient(s)

Oral ALD [Rats]: >5,000 mg/kg.

>>>Proprietary Ingredient(s)

No information found.

>>>Proprietary Ingredient(s)

ORAL LD50 [mouse]: >1000 mg/kg
DERMAL LD50 [rat]: > 500 mg/kg.

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
METHANOL						
Units: ppm			200	250 (S)	200	250 (S)
N-METHYL-2-PYRROLIDONE						
Units: ppm	10	(S)				

Also, DuPont has established and observes the following limits:

Name/Units	12 hr	8hr	15min	Ceiling
METHANOL				
Units: ppm	200	200		(S)
N-METHYL-2-PYRROLIDONE				
Units: ppm	5	5		(S)

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; In case of eye contact, immediately rinse with clean water for 20-30 minutes. Retract eyelids often. Obtain emergency medical attention.

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.

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

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.

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.

Recommended glove materials:

Neoprene(R), based on Du Pont experience. Because the product is a complex mixture, glove testing may be appropriate as part of the glove selection process.

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 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.).

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.).

Storage:

Store product in a cool location, 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 %
Methanol	1 - 5%
N-Methyl-2-Pyrrolidone	30 - 60%

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: 05/15/02

Person Responsible for MSDS: Environmental Technologist
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