



The MSDS format adheres to the standards and regulatory requirements of the United States and may not meet regulatory requirements in other countries.

DuPont
Material Safety Data Sheet

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6650CR Monomethylformamide
Revised 14-JUN-2007

CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Material Identification

Corporate MSDS Number : DU000390
CAS Number : 123-39-7
Formula : HCONHCH3
Molecular Weight : 59.04
CAS Name : FORMAMIDE, N-METHYL
Grade : TECHNICAL

Tradenames and Synonyms

MMF
N-METHYLFORMAMIDE

Company Identification

MANUFACTURER/DISTRIBUTOR
DuPont Chemical Solutions Enterprise
1007 Market Street
Wilmington, DE 19898

PHONE NUMBERS

Product Information : 1-800-441-7515 (outside the U.S.
302-774-1000)
Transport Emergency : CHEMTREC 1-800-424-9300(outside U.S.
703-527-3887)
Medical Emergency : 1-800-441-3637 (outside the U.S.
302-774-1000)

COMPOSITION/INFORMATION ON INGREDIENTS

Components

Material	CAS Number	%
MONOMETHYLFORMAMIDE	123-39-7	99.5
CARBON MONOXIDE	630-08-0	>0.1

Will be present in the space above MMF

HAZARDS IDENTIFICATION

Potential Health Effects

Causes skin and eye irritation. Overexposure may cause liver damage. May be absorbed through the skin in toxic amounts. Carbon monoxide may be present in the space above MMF at greater than 1,000 ppm. Overexposure to carbon monoxide decreases the oxygen carrying capacity of blood.

(HAZARDS IDENTIFICATION - Continued)

Gross overexposure to carbon monoxide may be fatal.

HUMAN HEALTH EFFECTS:

Experience suggests, based on a closely related material (dimethylformamide), that this material may be a skin irritant. Eye contact may cause severe eye irritation with discomfort, tearing, or blurring of vision. Skin permeation can occur in amounts capable of producing systemic toxicity. Ingestion may cause nonspecific discomfort, such as nausea, headache, or weakness. Higher exposures may lead to liver changes, nausea, anorexia, gastritis, or abdominal pain.

Carbon monoxide (CO) is a chemical asphyxiant. It reduces the oxygen carrying capacity of the blood due to formation of carboxyhemoglobin. Inhalation of CO can cause nausea, headache or weakness; and significant deterioration of brain function. Carboxyhemoglobin is a cherry red color and its presence in high concentrations may impart an abnormally bright red color to the skin, mucous membranes and fingernails, however, the more typical observations of CO overexposure are skin pallor (whiteness) or cyanosis (bluish discoloration) of the skin and extremities. The fetus is uniquely sensitive to CO such that inhalation overexposure of pregnant women may lead to fetal effects. Overexposure can also lead to neuropsychiatric symptoms (personality change and memory loss). Gross overexposures to CO may be fatal. The concentration of CO that is Immediately Dangerous to Life and Health (IDLH) is 1,200 ppm.

Individuals with preexisting diseases of the liver may have increased susceptibility to the toxicity of excessive exposures.

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.

FIRST AID MEASURES

First Aid

INHALATION

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

EYE CONTACT

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

(FIRST AID MEASURES - Continued)

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; discard contaminated shoes.

INGESTION

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

NOTE:

To prepare activated charcoal slurry, suspend 50 grams of activated charcoal in 400 mL of water in a bottle and shake well. Give 5 mL/kg of body weight, or 350 mL for an average adult.

NOTES TO PHYSICIAN:

Because of the presence of carbon monoxide, additional medical treatment recommendations are warranted.

Absorption of carbon monoxide may lead to the formation of carboxyhemoglobin that, in sufficient concentration, causes cyanosis. Since reversion of carboxyhemoglobin to hemoglobin occurs spontaneously after termination of exposure, moderate degrees of cyanosis need be treated only by supportive measures such as bed rest and oxygen inhalation.

More severe exposures may require the following:

Promptly administer oxygen under increased pressure. Transport to a hyperbaric chamber as quickly as possible. Meanwhile, administer artificial respiration if the person is not breathing. Oxygen should be given at the highest possible concentration, but it is beneficial for it to contain 3 to 5% carbon dioxide as a stimulant to respiration. High partial pressure of oxygen speeds the release of CO from hemoglobin and increased respiration keeps oxygen pressure high and CO pressure low in the alveoli.

FIRE FIGHTING MEASURES

Flammable Properties

Flash Point : 119 C (246 F)
Flammable limits in Air, % by Volume
LEL : 1.8
UEL : 19.7
Autoignition : 323 C (613 F)

Actual AITs can be affected by the concentration of vapor and oxygen, vapor/air contact time, pressure, volume, catalytic impurities, etc. Processing conditions should be analyzed to determine if the AITs may be higher or lower.

Fire and Explosion Hazards:

OSHA Class III B Combustible Liquid. Vapors are heavier than air and may travel to source of ignition. Follow appropriate National Fire Protection Association (NFPA) codes.

Extinguishing Media

Water Fog, Foam, Dry Chemical, CO2.

Fire Fighting Instructions

Firefighters should wear full protective equipment including a self-contained breathing apparatus.

Note: Firefighters' protective clothing may not provide chemical resistance to MMF. Chemical resistant suit with hood and self-contained breathing apparatus should be worn where liquid contact with MMF could occur. Decontaminate all equipment used in firefighting efforts before returning to service.

ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Accidental Release Measures

Dike spill with sand or earth. Absorb with sand or other noncombustible absorbent material and transfer to covered steel drums for recovery or disposal. Flush away remaining traces with water spray. Comply with Federal, State, and local regulations for reporting releases. Carbon monoxide concentrations above a spill are possible.

HANDLING AND STORAGE

Handling (Personnel)

Do not get in eyes, on skin or clothing. Avoid breathing vapors or mist. Wash thoroughly after handling.

Storage

Keep container tightly closed.

Tanks should never be vented to a closed environment.

(See "Hazardous Reactivity" section.)

EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Use with sufficient ventilation to keep employee exposure below the suggested limits. The area immediately around a tank vent being filled with MMF should be restricted due to potential carbon monoxide evolution. Do not look down into an open container of MMF.

Walking/working surfaces must be maintained free of liquid MMF.

Personal Protective Equipment

EYE/FACE PROTECTION:

Wear coverall chemical splash goggles. Additionally, wear a face shield where the possibility exists for face contact due to splashing or spraying of material.

RESPIRATORS:

Where there is potential for airborne exposures in excess of applicable limits wear NIOSH approved positive pressure air-supplied respirator. Respirator breakthrough studies show organic vapor cartridges afford protection for MMF and may be used at airborne concentrations up to 10 ppm. However, dissolved carbon monoxide may be released or present in concentrations exceeding the exposure limits requiring use of an air-supplied respirator.

PROTECTIVE CLOTHING:

Wear impervious clothing to prevent any contact with the material such as gloves, apron, pants and jacket, hood and boots or totally encapsulating chemical suit with breathing air supply.

(EXPOSURE CONTROLS/PERSONAL PROTECTION - Continued)

Where there is potential for hand contact with liquid MMF, butyl gloves must be worn. Neoprene gloves are acceptable for short duration tasks such as turning process valves and product transfer operations where more durable abrasion resistant gloves are needed.

NOTE: Gloves should be inspected before each use and discarded if they show tears, pinholes, or signs of wear.

Exposure Guidelines

Exposure Limits

Monomethylformamide

PEL (OSHA)	: None Established
TLV (ACGIH)	: None Established
AEL * (DuPont)	: 2 ppm, 8 & 12 Hr. TWA, Skin

Other Applicable Exposure Limits

CARBON MONOXIDE

PEL (OSHA)	: 50 ppm, 55 mg/m ³ , 8 Hr. TWA
TLV (ACGIH)	: 25 ppm, 29 mg/m ³ , 8 Hr. TWA
AEL * (DuPont)	: 50 ppm, 8 Hr. TWA 25 ppm, 12 Hr. TWA

* 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.

PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

Boiling Point	: 198-199 C (388-390 F) @ 760 mm Hg
Vapor Pressure	: 0.2 mm Hg @ 25 C (77 F)
Melting Point	: -4 C (25 F) (25 deg F)
Evaporation Rate	: <1 (Butyl Acetate=1.0)
Solubility in Water	: Soluble
Odor	: Slight amine
Form	: Clear liquid
Color	: Colorless
Specific Gravity	: 1.0 @ 25 C (77 F)

STABILITY AND REACTIVITY

Chemical Stability

Stable.

(STABILITY AND REACTIVITY - Continued)

Incompatibility with Other Materials

Incompatible with benzene sulfonyl chloride. May also react with chlorine, bromine, nitrates, nitric acid, triethylaluminum, potassium permanganate, chromic acid (chromic anhydride, chromium trioxide, CrO₃), borohydrides, hydrides, thionyl chloride, metallic sodium, phosphorous trioxide, diborane, octafluoroisobutyrate with sodium nitrite, and perchloryl fluoride (FClO₃) with potassium methyl 4,4-dinitrobutyrate.

Decomposition

Decomposes slowly at ambient temperatures to monomethylamine and carbon monoxide. Decomposes more rapidly when heated or in the presence of sodium metal catalysts. Contains dissolved carbon monoxide which can be released at ambient temperatures.

Polymerization

Polymerization will not occur.

TOXICOLOGICAL INFORMATION

Animal Data

MMF:

Inhalation ALC: > 4140 ppm in rats
Skin absorption ALD: 1,500 mg/kg in pregnant rabbits
Oral LD50: 4,000 mg/kg in rats

Carbon Monoxide:

Inhalation LC50, 4 hr: 1300 ppm in rats

MMF is untested for skin irritancy, is a severe eye irritant, and is untested for animal sensitization. Toxic effects described in rats from a single high exposure by inhalation include severe weight loss. Repeated inhalation exposure to approximately 60-200 times the AEL caused reversible functional and microscopic liver changes. Repeated dermal applications resulted in liver necrosis and lung edema with fatalities in rabbits. Tests for carcinogenic activity have not been performed. Developmental toxicity has been observed in animals at doses that were also maternally toxic. No reproduction studies have been conducted. While testicular effects were observed in rats or mice administered near lethal doses, no testicular effects were observed at dose levels not producing other toxic effects. The compound does not produce genetic damage in bacterial cell cultures but has not been tested in

(TOXICOLOGICAL INFORMATION - Continued)

animals.

Carbon monoxide is not an eye irritant. It is untested for skin irritancy or for animal sensitization. The effects in animals from single exposure by inhalation to approximately 1-32 times the TLV include formation of carboxyhemoglobin, cardiovascular, lung and behavioral changes, fatigue, blood pressure and pulse alterations. Higher exposures resulted in weight loss, irregular respiration, carboxhemoglobin formation, and death. Repeated exposures to 2 times the TLV caused decreased liver weights, hormone changes, nervous system changes, and brain damage. Long term exposures to 1-10 times the AEL resulted in increased spleen weights, higher red cell counts, and cardiac changes. No animal data are available to define the carcinogenic, reproductive, or mutagenic hazards of Carbon monoxide. Tests have shown Carbon monoxide to cause developmental toxicity in animals.

ECOLOGICAL INFORMATION

Ecotoxicological Information

AQUATIC TOXICITY

96-hour LC50, fathead minnows: >5,000 mg/L

Readily biodegradable in OECD 301 biodegradation study.

DISPOSAL CONSIDERATIONS

Waste Disposal

Obey Federal, State, and local laws for disposal. If approved, may be disposed of by incineration, bio-oxidation, or by removal to a properly licensed landfill. Bio-oxidation feasibility may first have to be confirmed in tests using simulated waste stream and bio-organism conditions, particularly if MMF is a new nutrient or is increased to substantial concentrations in a waste stream. Bacteria must be acclimated to MMF.

TRANSPORTATION INFORMATION

Shipping Information

Shipping Containers

Tank Cars.
Tank Trucks.

(TRANSPORTATION INFORMATION - Continued)

Sample containers.

NOT REGULATED AS A HAZARDOUS MATERIAL BY DOT OR IMO.

REGULATORY INFORMATION

U.S. Federal Regulations

TSCA Inventory Status : Reported/Included.

TITLE III HAZARD CLASSIFICATIONS SECTIONS 311, 312

Acute : Yes
Chronic : Yes
Fire : No
Reactivity : No
Pressure : No

LISTS:

SARA Extremely Hazardous Substance - No
CERCLA Hazardous Substance - No
SARA Toxic Chemical - No

OTHER INFORMATION

NFPA, NPCA-HMIS

NPCA-HMIS Rating
Health : 2
Flammability : 1
Reactivity : 0

Personal Protection rating to be supplied by user depending on use conditions.

Additional Information

SKIN NOTATION DEFINITION:

The "Skin" notation in the Exposure Limits section indicates that MMF liquid and vapor are capable of penetrating skin and mucous membranes. Control of vapor inhalation alone may not be sufficient to prevent absorption of an excessive dose; skin contact should be avoided.

WARNING!

Carbon monoxide is known to the State of California to cause Reproductive Toxicity.

(Continued)

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.

Responsible for MSDS : MSDS Coordinator
> : DuPont Chemical Solutions Enterprise
Address : Wilmington, DE 19898
Telephone : (800) 441-7515

Indicates updated section.

This information is based upon technical information believed to be reliable. It is subject to revision as additional knowledge and experience is gained.

End of MSDS