



SIGMA-ALDRICH

Material Safety Data Sheet

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Section 1 - Product and Company Information

Product Name N,N-Dimethylformamide, anhydrous, 99.8%
Product Number 227056
Brand Aldrich Chemical

Company Sigma-Aldrich
Street Address 3050 Spruce Street
City, State, Zip, Country SAINT LOUIS, MO 63103 US
Technical Phone: 314 771 5765
Fax: 800 325 5052
Emergency Phone: 414 273 3850 Ext. 5996

Section 2 - Composition/Information on Ingredient

| Substance Name | CAS # | SARA 313 | EC no | Annex I Index Number |
|-------------------|---------|----------|-----------|----------------------|
| DIMETHYLFORMAMIDE | 68-12-2 | Yes | 200-679-5 | 616-001-00-X |

Formula C₃H₇NO
Synonyms Dimethylamid kyseliny mravenci (Czech), Dimethylformamid (German), Dimethyl formamide, N,N-Dimethyl formamide, Dimethylformamide (ACGIH:OSHA), N,N-Dimethylmethanamide, Dimetilformamide (Italian), Dimetylformamidu (Czech), DMF, DMFA, Dwumetyloformamid (Polish), N-Formyldimethylamine, NCI-C60913, NSC 5356, U-4224

Section 3 - Hazards Identification

Emergency Overview

Toxic.
May cause harm to the unborn child. Harmful by inhalation and in contact with skin. Irritating to eyes and skin.
Combustible. Readily absorbed through skin. Target organ(s): Liver. Kidneys.

HMIS Rating
Health: 2* Flammability: 2 Reactivity: 0

NFPA Rating
Health: 2 Flammability: 2 Reactivity: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

Oral Exposure

If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately.

Inhalation Exposure

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

Dermal Exposure

In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

Eye Exposure

In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

Flash Point: 136.4 °F 58 °C
Explosion Limits: Lower: 2.2 % Upper: 15.2 %
Autoignition Temp: 445 °C

Extinguishing Media

Suitable

Carbon dioxide, dry chemical powder, or appropriate foam.

Firefighting

Protective Equipment

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Specific Hazard(s)

Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

Procedure to be Followed in Case of Leak or Spill

Evacuate area.

Procedure(s) of Personal Precaution(s)

Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves. Wear disposable coveralls and discard them after use.

Methods for Cleaning Up

Cover with dry lime or soda ash, pick up, keep in a closed container, and hold for waste disposal. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

Handling

User Exposure

Do not breathe vapor. Do not breathe mist. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

Storage

Suitable

Keep tightly closed. Keep away from heat and open flame. Store in a cool dry place.

Section 8 - Exposure Controls / PPE

Engineering Controls

Use only in a chemical fume hood. Safety shower and eye bath.

Personal Protective Equipment

Respiratory

Government approved respirator.

Hand

Compatible chemical-resistant gloves.

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Eye
Chemical safety goggles.

General Hygiene Measures

Wash thoroughly after handling. Wash contaminated clothing before reuse. Discard contaminated shoes.

Exposure Limits

| Country | Type | Value |
|---------|-------|----------|
| Poland | NDS | 10 MG/M3 |
| Poland | NDSch | - |
| Poland | NDSP | - |

Exposure Limits, RTECS

| Country | Source | Type | Value |
|--------------------------|-------------------|------|---------------------------------|
| USA | ACGIH | TWA | 10 PPM |
| Remarks: Skin | | | |
| USA | MSHA Standard-air | TWA | 10 PPM (30 MG/M3) (SKIN) |
| USA | OSHA | PEL | 8H TWA 10 PPM (30 MG/M3) (SKIN) |
| New Zealand | OEL | | |
| Remarks: check ACGIH TLV | | | |
| USA | NIOSH | TWA | 10 PPM (SK) |

Section 9 - Physical/Chemical Properties

| Appearance | Color | Form | Odor |
|-----------------------|-------------------------------|--------------|--------------------|
| | Colorless | Clear liquid | Fishy |
| Molecular Weight: | 73.1 AMU | | |
| pH | 6.7 | | |
| BP/BP Range | 153 - 155 °C | | |
| MP/MP Range | -61 °C | | |
| Freezing Point | N/A | | |
| Vapor Pressure | 2.7 mmHg | 20 °C | |
| Vapor Density | 2.5 g/l | | |
| Saturated Vapor Conc. | N/A | | |
| SG/Density | 0.948 g/cm3 | | |
| Bulk Density | N/A | | |
| Odor Threshold | N/A | | |
| Volatile% | N/A | | |
| VOC Content | N/A | | |
| Water Content | N/A | | |
| Solvent Content | N/A | | |
| Evaporation Rate | N/A | | |
| Viscosity | N/A | | |
| Partition Coefficient | Log Kow: -1.01 | | |
| Decomposition Temp. | N/A | | |
| Flash Point °F | 136.4 °F | | Method: closed cup |
| Flash Point °C | 58 °C | | Method: closed cup |
| Explosion Limits | Lower: 2.2 % Upper: 15.2 % | | |
| Flammability | N/A | | |
| Autoignition Temp | 445 °C | | |
| Refractive Index | 1.43 | | |

Solubility
Solubility in Water: Miscible.
Other Solvents: ALCOHOL, ETHER, ACETONE.

N/A = not available

Section 10 - Stability and Reactivity

Stability

Stable

Stable.

Materials to Avoid

Strong oxidizing agents.

Hazardous Decomposition Products

Hazardous Decomposition Products

Thermal decomposition may produce carbon monoxide, carbon dioxide, and nitrogen oxides.

Hazardous Polymerization

Hazardous Polymerization

Will not occur.

Section 11 - Toxicological Information

Route of Exposure

Skin Contact

Causes skin irritation.

Skin Absorption

Harmful if absorbed through skin.

Eye Contact

Causes eye irritation.

Inhalation

Harmful if inhaled.

Ingestion

May be harmful if swallowed.

Target Organ(s) or System(s)

Liver. Kidneys. Central nervous system. Cardiovascular system. Blood.

Signs and Symptoms of Exposure

Warning: intolerance for alcohol can occur up to 4 days after dimethylformamide exposure. N,N-dimethylformamide is considered to be a potent liver toxin. Exposure can cause: Stomach pains, vomiting, diarrhea. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

RTECS Number: LQ2100000

Toxicity Data

Skin - Rabbit: 4,720 mg/kg(LD50)

Oral - Rat: 2,800 mg/kg(LD50)

Inhalation - Rat: 6,000 ppm()

Oral - Rat: 2800 mg/kg (LD50)

Intraperitoneal - Rat: 1400 MG/KG (LD50)

Remarks: Behavioral:Somnolence (general depressed activity).

Behavioral:Muscle weakness.

Nutritional and Gross Metabolic:Weight loss or decreased weight gain.

Subcutaneous - Rat: 3800 MG/KG (LD50)

Intravenous - Rat: 2 GM/KG (LD50)

Oral - Mouse: 2900 mg/kg (LD50)

Inhalation - Mouse: 9,400 mg/m3 (LC50)
Remarks: Behavioral:Convulsions or effect on seizure threshold.
Behavioral:Muscle weakness,
Lungs, Thorax, or Respiration:Dyspnea,

Intraperitoneal - Mouse: 650 MG/KG (LD50)

Subcutaneous - Mouse: 4500 MG/KG (LD50)

Intravenous - Mouse: 2500 MG/KG (LD50)

Intramuscular - Mouse: 3900 MG/KG (LD50)

Intravenous - Dog: 470 MG/KG (LD50)

Intraperitoneal - Cat: 500 MG/KG (LD50)

Remarks: Liver:Other changes,
Kidney, Ureter, Bladder:Other changes in urine composition,
Blood:Changes in cell count (unspecified).

Oral - Rabbit: 5000 mg/kg (LD50)

Skin - Rabbit: 4720 mg/kg (LD50)

Intraperitoneal - Rabbit: 1 GM/KG (LD50)

Remarks: Liver:Other changes,
Kidney, Ureter, Bladder:Other changes in urine composition,
Blood:Changes in cell count (unspecified).

Intravenous - Rabbit: 1800 MG/KG (LD50)

Intravenous - Guinea pig: 1050 MG/KG (LD50)

Irritation Data

Skin - Human: 100 % 24H

Remarks: Mild irritation effect

Eyes - Rabbit: 100 mg

Remarks: Rinsed

Chronic Exposure - Carcinogen

Result: This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH,
NTP, or EPA classification.

IARC Carcinogen List

Rating

Group 3

ACGIH Carcinogen List

Rating

A4

Chronic Exposure - Teratogen

| <u>Species</u> | <u>Dose</u> | <u>Route of Application</u> | <u>Exposure Time</u> |
|---|-------------|-----------------------------|----------------------|
| Result:May cause congenital malformation in the fetus. | | | |
| Rat | 5330 UL/KG | Oral | (6-15D PREG) |
| Result:Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Musculoskeletal system. | | | |
| Rat | 300 PPM/6H | Inhalation | (6-15D PREG) |
| Result:Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). | | | |
| Rat | 3600 MG/KG | Skin | (11-13D PREG) |
| Result:Effects on Embryo or Fetus: Fetal death. | | | |
| Rat | 7552 MG/KG | Skin | (6-15D PREG) |
| Result:Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Effects on Embryo or Fetus: Other effects to embryo. | | | |
| Mouse | 1820 MG/KG | Oral | (6-15D PREG) |
| Result:Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). | | | |
| Mouse | 15120 MG/KG | Intraperitoneal | (1-14D PREG) |
| Result:Specific Developmental Abnormalities: Musculoskeletal system. | | | |

Specific Developmental Abnormalities: Craniofacial (including nose and tongue).
Specific Developmental Abnormalities: Other developmental abnormalities.

| | | | |
|---|------------|------------|--------------|
| Rabbit | 2600 MG/KG | Oral | (6-18D PREG) |
| Result:Specific Developmental Abnormalities: Central nervous system. Specific Developmental Abnormalities: Body wall. Specific Developmental Abnormalities: Musculoskeletal system. | | | |
| Rabbit | 2600 MG/KG | Oral | (6-18D PREG) |
| Result:Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). | | | |
| Rabbit | 450 PPM/6H | Inhalation | (7-19D PREG) |
| Result:Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Body wall. Specific Developmental Abnormalities: Musculoskeletal system. | | | |
| Rabbit | 5200 MG/KG | Skin | (6-18D PREG) |
| Result:Effects on Embryo or Fetus: Other effects to embryo. | | | |

Chronic Exposure - Mutagen

| <u>Species</u> | <u>Dose</u> | <u>Route</u> | <u>Mutation test</u> |
|----------------|---------------|---------------------|---|
| Human | 12300 UG/M3/Y | Inhalation | Cytogenetic analysis |
| Human | 100 NMOL/L | | lymphocyte Cytogenetic analysis |
| Rat | 10700 UG/M3 | Inhalation | Dominant lethal test |
| Mouse | 500 UG/KG | Intraperitoneal 24H | Micronucleus test |
| Mouse | 40 UMOL/KG | Intraperitoneal | Cytogenetic analysis |
| Mouse | 5 GM/L | | lymphocyte Mutation in mammalian somatic cells. |
| Mouse | 4250 UG/KG | | S. typhimurium Host-mediated assay |

Chronic Exposure - Reproductive Hazard

| <u>Species</u> | <u>Dose</u> | <u>Route of Application</u> | <u>Exposure Time</u> |
|--|---------------|-----------------------------|----------------------|
| Rat | 5030 MG/KG | Oral | (6-15D PREG) |
| Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). | | | |
| Rat | 800 PPM/6H | Inhalation | (13W PRE) |
| Result: Maternal Effects: Other effects. Endocrine:Effect on menstrual cycle. | | | |
| Rat | 50 PPM/6H | Inhalation | (13W MALE) |
| Result: Paternal Effects: Spermatogenesis (including genetic material, sperm morphology,motility, and count). | | | |
| Rat | 4 MG/M3/4H | Inhalation | (1-19D PREG) |
| Result: Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Effects on Embryo or Fetus: Fetal death. | | | |
| Rat | 600 MG/M3/24H | Inhalation | (1-19D PREG) |
| Result: Effects on Newborn: Behavioral. | | | |
| Rat | 287 PPM/6H | Inhalation | (0-19D PREG) |
| Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). | | | |
| Rat | 20 GM/KG | Skin | (6-15D PREG) |
| Result: Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea). Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). | | | |
| Rat | 20 GM/KG | Skin | (1-20D PREG) |
| Result: Effects on Fertility: Female fertility index (e.g., # females pregnant per # sperm positive females; # females pregnant per # females mated). Effects on Newborn: Delayed effects. | | | |
| Mouse | 200 PPM/6H | Inhalation | (13W PRE) |
| Result: Maternal Effects: Other effects. Endocrine:Effect on menstrual cycle. | | | |
| Mouse | 2100 MG/KG | Intraperitoneal | (11D PREG) |
| Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). | | | |
| Rabbit | 450 PPM/8H | Inhalation | (7-19D PREG) |
| Result: Maternal Effects: Other effects. Specific Developmental Abnormalities: Musculoskeletal system. Specific Developmental Abnormalities: Gastrointestinal system. | | | |

Section 12 - Ecological Information

No data available.

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Acute Ecotoxicity Tests

Test Type

EC50 Daphnia

Species

Daphnia magna

Time: 48.0 h
Value: 9,600 - 13,100 mg/l

Test Type

LC50 Fish

Species

Lepomis macrochirus (Bluegill)

Time: 96.0 h
Value: 6,700 - 7,500 mg/l

Test Type

LC50 Fish

Species

Onchorhynchus mykiss (Rainbow trout)

Time: 96.0 h
Value: 9,000 - 13,000 mg/l

Test Type

LC50 Fish

Species

Pimephales promelas (Fathead minnow)

Time: 96.0 h
Value: 10,400 - 10,800 mg/l

Section 13 - Disposal Considerations

Appropriate Method of Disposal of Substance or Preparation

This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT

Proper Shipping Name: N,N-Dimethylformamide

UN#: 2265

Class: 3

Packing Group: Packing Group III

Hazard Label: Flammable liquid

PIH: Not PIH

IATA

Proper Shipping Name: N,N-Dimethylformamide

IATA UN Number: 2265

Hazard Class: 3

Packing Group: III

Section 15 - Regulatory Information

EU Directives Classification

Symbol of Danger: T

Indication of Danger

Toxic.

Risk Statements R: 61 20/21 36

May cause harm to the unborn child. Harmful by inhalation and in contact with skin. Irritating to eyes.

Safety Statements S: 53 45

Restricted to professional users. Attention - Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

US Classification and Label Text

Indication of Danger

Toxic.

Risk Statements

May cause harm to the unborn child. Harmful by inhalation and in contact with skin. Irritating to eyes and skin.

Safety Statements

In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Wear suitable protective clothing, gloves, and eye/face protection. Do not breathe vapor.

US Statements

Combustible. Readily absorbed through skin. Target organ(s): Liver, Kidneys.

United States Regulatory Information

SARA Listed: Yes

Demimis: 1 %

Notes: This product is subject to SARA section 313 reporting requirements.

TSCA Inventory Item: Yes

Canada Regulatory Information

WHMIS Classification

This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.

DSL: Yes

NDSL: No

Section 16 - Other Information

Disclaimer

For R&D use only. Not for drug, household or other uses.

Warranty

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2005 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.