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ISO 9001: 2015

MATERIAL SAFETY DATA SHEET

1. Identification

1.1 GHS Product identifier

N,N-Dimethylformamide, anhydrous, 99.8%

Code: D 2033

2. Hazard identification

2.1 Classification of the substance or mixture

Acute toxicity - Dermal, Category 4

Eye irritation, Category 2

Acute toxicity - Inhalation, Category 4

Reproductive toxicity, Category 1B

2.2 GHS label elements, including precautionary statements

Pictogram(s)



Signal word

Hazard statement(s)

Danger

H312 Harmful in contact with skin

H319 Causes serious eye irritation

H332 Harmful if inhaled

Precautionary statement(s)

Prevention

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P264 Wash ... thoroughly after handling.

P261 Avoid breathing dust/fume/gas/mist/vapours/spray.

P271 Use only outdoors or in a well-ventilated area.

P201 Obtain special instructions before use.

P202 Do not handle until all safety precautions have been read and understood.

P302+P352 IF ON SKIN: Wash with plenty of water/...

P312 Call a POISON CENTER/doctor/2026 if you feel unwell.

P321 Specific treatment (see ... on this label).

P362+P364 Take off contaminated clothing and wash it before reuse.

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P337+P313 If eye irritation persists: Get medical advice/attention.

P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.

P308+P313 IF exposed or concerned: Get medical advice/ attention.

P405 Store locked up.

P501 Dispose of contents/container to ...

Storage

Disposal

2.3 Other hazards which do not result in classification

none

3. Composition/information on ingredients

3.1 Substances

Chemical name	Common names and synonyms	CAS number	EC number	Concentration
N,N-dimethylformamide	N,N-dimethylformamide	68-12-2	none	100%

4. First-aid measures

4.1 Description of necessary first-aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

Fresh air, rest. Refer for medical attention.

In case of skin contact

Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .

In case of eye contact

First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.

If swallowed

Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

4.2Most important symptoms/effects, acute and delayed

Irritation of eyes, skin and nose. May cause nausea. (USCG, 1999)

4.3Indication of immediate medical attention and special treatment needed, if necessary

Immediate first aid: Ensure that adequate decontamination has been carried out. If patient is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask, as trained. Perform CPR as necessary.

Immediately flush contaminated eyes with gently flowing water. Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration. Keep patient quiet and maintain normal body temperature. Obtain medical attention. /Organic acids and related compounds/

5.Fire-fighting measures

5.1Extinguishing media

Suitable extinguishing media

Wear self contained breathing apparatus for fire fighting if necessary.

5.2Specific hazards arising from the chemical

Special Hazards of Combustion Products: Vapors are irritating (USCG, 1999)

5.3Special protective actions for fire-fighters

Wear self-contained breathing apparatus for firefighting if necessary.

6.Accidental release measures

6.1Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.

Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2Environmental precautions

Personal protection: complete protective clothing including self-contained breathing apparatus. Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

6.3Methods and materials for containment and cleaning up

Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas.

7.Handling and storage

7.1Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Avoid exposure - obtain special instructions before use. Provide appropriate exhaust ventilation at places where dust is formed. For precautions see section 2.2.

7.2Conditions for safe storage, including any incompatibilities

Separated from incompatible materials. See Chemical Dangers. Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Handle and store under inert gas.

8.Exposure controls/personal protection

8.1Control parameters

Occupational Exposure limit values

Recommended Exposure Limit: 10 Hour Time-Weighted Average: 10 ppm (30 mg/cu m), skin.

Biological limit values

no data available

8.2Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

8.3Individual protection measures, such as personal protective equipment (PPE)

Eye/face protection

Safety glasses with side-shields conforming to EN166. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Wear impervious clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace. Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands. The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

Respiratory protection

Wear dust mask when handling large quantities.

Thermal hazards

no data available

9.Physical and chemical properties

Physical state

Clear colorless liquid

Colour

Colorless to very slightly yellow liquid

Odour

Fishy odor

Melting point/ freezing point

-61\u00b0C(lit.)

Boiling point or initial boiling point and boiling range

153\u00b0C(lit.)

Flammability	Class II Combustible Liquid: Fl.P. at or above 37.78°C and below 60°C. Flammable. Gives off irritating or toxic fumes (or gases) in a fire.
Lower and upper explosion limit / flammability limit	Lower flammable limit: 2.2% by volume at 212 deg F (100°C); Upper flammable limit: 15.2% by volume
Flash point	58°C
Auto-ignition temperature	445°C
Decomposition temperature	no data available
pH	pH = 6.7 (0.5 molar solution in water)
Kinematic viscosity	0.802 cP at 25°C
Solubility	In water: soluble
Partition coefficient n-octanol/water (log value)	no data available
Vapour pressure	2.7 mm Hg (20°C)
Density and/or relative density	0.944g/mL(lit.)
Relative vapour density	2.5 (vs air)
Particle characteristics	no data available

10. Stability and reactivity

10.1 Reactivity

no data available

10.2 Chemical stability

DMF is stable. It is hygroscopic and easily absorbs water from a humid atmosphere and should therefore be kept under dry nitrogen. High purity DMF, required for acrylic fibers, is best stored in aluminum tanks. DMF does not change under light or oxygen and does not polymerize spontaneously. Temperatures >350°C may cause decomposition to form dimethylamine and carbon dioxide, with pressure developing in closed containers.

10.3 Possibility of hazardous reactions

Combustible. N,N-DIMETHYLFORMAMIDE may react violently with a broad range of chemicals, e.g.: alkaline metals (sodium, potassium), azides, hydrides (sodium borohydride, lithium aluminum hydride), bromine, chlorine, carbon tetrachloride, hexachlorocyclohexane, phosphorus pentoxide, triethylaluminum, magnesium nitrate, organic nitrates. Forms explosive mixtures with lithium azide [Bretherick, 5th ed., 1995, p. 453]. Oxidation by chromium trioxide or potassium permanganate may lead to explosion [Pal B. C. et al., Chem. Eng. News, 1981, 59, p. 47].

10.4 Conditions to avoid

no data available

10.5 Incompatible materials

CAN REACT VIGOROUSLY WITH OXIDIZING AGENTS, HALOGENATED HYDROCARBONS, & INORG NITRATES.

10.6 Hazardous decomposition products

When heated to decomposition it emits toxic fumes of /nitrogen oxides/.

11. Toxicological information

Acute toxicity

Oral: LD50 Mouse oral 6.8 mL/kg

Inhalation: LC50 Mouse inhalation 9400 mg/cu m/2 hr

Dermal: no data available

Skin corrosion/irritation

no data available

Serious eye damage/irritation

no data available

Respiratory or skin sensitization

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

Evaluation: There is inadequate evidence in humans for the carcinogenicity of dimethylformamide. There is evidence suggesting the lack of carcinogenicity of dimethylformamide in experimental animals. Overall evaluation: Dimethylformamide is not classifiable as to its carcinogenicity in humans (Group 3).

Reproductive toxicity

Only one study is available on the reproductive effects of dimethylformamide in humans. This study reported an increased rate of spontaneous abortion among pregnant women occupationally exposed to dimethylformamide. However, these results cannot be attributed solely to dimethylformamide, as these women were exposed to a number of additional chemicals. Dimethylformamide is embryotoxic in animals; reduced implantation efficiency, decreased mean fetal weight, and increased abortions have been reported in rats exposed by inhalation. In rabbits exposed to dimethylformamide by gavage (experimentally placing the chemical in the stomach), decreased mean fetal weight and increased percentage of malformed live fetuses per litter and increased percentage of litters with malformed fetuses were observed in the high-dose group.

STOT-single exposure

no data available

STOT-repeated exposure

no data available

Aspiration hazard

no data available

12. Ecological information

12.1 Toxicity

Toxicity to fish: LC50; Species: /Oncorhynchus mykiss/ (rainbow trout) weight 0.8 g; Conditions: static bioassay; Concentration: 12,000 mg/L for 96 hr (95% confidence limits 10,000-13,000 mg/L)

Toxicity to daphnia and other aquatic invertebrates: EC50; Species: Daphnia magna (Water flea) age <24 hr; Conditions: freshwater, static, 20.5\00b0C, pH 7.04-7.97, hardness 46.4 (40.4-56.3) mg/L CaCO₃, alkalinity 41.7 (30.0-46.0) mg/L CaCO₃, dissolved oxygen 85.5 (77.5-90.8) mg/L; Concentration: 26300000 ug/L for 24 hr (95% confidence interval: 23400000-29600000 ug/L); Effect: intoxication, immobilization

Toxicity to algae: EC50; Species: Anabaena inaequalis (Blue-Green Algae) 1X10+6 cells/mL; Conditions: freshwater, static; Concentration: 0.6% for 10-14 days (95% confidence interval: 0.36-0.84%); Effect: growth, general /formulation

Toxicity to microorganisms: no data available

12.2 Persistence and degradability

AEROBIC: Aerobic unacclimated and acclimated river die-away tests showed that N,N-dimethylformamide at an initial concentration of 30 mg/L completely disappeared within 6 and 3 days, respectively(1). However, 24 to 48 hours was required before any degradation was observed among unacclimated samples(1). N,N-Dimethylformamide, present at 100 mg/L, reached 4.4% of its theoretical BOD in 2 weeks using an activated sludge inoculum at 30 mg/L in the Japanese MITI test(2). Aerobic grab sample data for N,N-dimethylformamide in sea water showed a mineralization rate of <3% in 24 hours for initial concentration of 10 ug/L and 100 ug/L(3). However, 20% of N,N-dimethylformamide at a concentration of 0.1 ug/L was mineralized in 24 hrs(3). All samples were adjusted to sterilized controls(3). Aqueous screening test data demonstrated that dimethylformamide was easily removed by sewage treatment facilities upon acclimation(4). Wastewater from a polyimide synthesis operation at Kansas City, MO contained N,N-dimethylformamide at a concentration of 65,500 mg/L before entering a bench scale biological treatment system(5). At feed rates of 90 lb/day/1000 cu ft, effluent from the biological reactor contained N,N-dimethylformamide at a concentration of <10 mg/L(5). The concentration of N,N-dimethylformamide in the reactor sludge was not documented(5).

12.3 Bioaccumulative potential

BCFs of 0.3-1.2 and 0.3-0.8 were reported in carp (Cyprinus carpio) when exposed to 2 and 20 ppm of N,N-dimethylformamide over a 2-week period, respectively(1). According to a classification scheme(2), these BCFs suggest the potential for bioconcentration in aquatic organisms is low(SRC).

12.4 Mobility in soil

Using a structure estimation method based on molecular connectivity indices(1), the Koc of N,N-dimethylformamide can be estimated to be 1(SRC). According to a classification scheme(2), this estimated Koc value suggests that N,N-dimethylformamide is expected to have very high mobility in soil.

12.5 Other adverse effects

no data available

13. Disposal considerations

13.1 Disposal methods

Product

The material can be disposed of by removal to a licensed chemical destruction plant or by controlled incineration with flue gas scrubbing. Do not contaminate water, foodstuffs, feed or seed by storage or disposal. Do not discharge to sewer systems.

Contaminated packaging

Containers can be triply rinsed (or equivalent) and offered for recycling or reconditioning. Alternatively, the packaging can be punctured to make it unusable for other purposes and then be disposed of in a sanitary landfill. Controlled incineration with flue gas scrubbing is possible for combustible packaging materials.

14. Transport information

14.1 UN Number

ADR/RID: UN2265

IMDG: UN2265

IATA: UN2265

14.2 UN Proper Shipping Name

ADR/RID: N,N-DIMETHYLFORMAMIDE

IMDG: N,N-DIMETHYLFORMAMIDE

IATA: N,N-DIMETHYLFORMAMIDE

14.3 Transport hazard class(es)

ADR/RID: 3

IMDG: 3

IATA: 3

14.4 Packing group, if applicable

ADR/RID: III

IMDG: III

IATA: III

14.5 Environmental hazards

ADR/RID: no

IMDG: no

IATA: no

14.6 Special precautions for user

no data available

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

no data available

15. Regulatory information

15.1 Safety, health and environmental regulations specific for the product in question

Chemical name	Common names and synonyms	CAS number	EC number
N,N-dimethylformamide	N,N-dimethylformamide	68-12-2	none
European Inventory of Existing Commercial Chemical Substances (EINECS)			Listed.
EC Inventory			Listed.
United States Toxic Substances Control Act (TSCA) Inventory			Listed.

China Catalog of Hazardous chemicals 2015	Listed.
New Zealand Inventory of Chemicals (NZIoC)	Listed.
Philippines Inventory of Chemicals and Chemical Substances (PICCS)	Listed.
Vietnam National Chemical Inventory	Listed.
Chinese Chemical Inventory of Existing Chemical Substances (China IECSC)	Listed.

Section 16: Other Information

This safety data sheet should be used in conjunction with technical sheets. It does not replace them. The information given is based on our knowledge of this product, at the time of publication. It is given in good faith. The attention of the user is drawn to the possible risks incurred by using the product for any other purpose other than that for which it was intended. This does not in any way excuse the user from knowing and applying all the regulations governing his activity. It is the sole responsibility of the user to take all precautions required in handling the product. The aim of the mandatory regulations mentioned is to help the user to fulfill his obligations regarding the use of hazardous products.

