1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers
Product name: N,N-Dimethylformamide

Product Number: D4551
Brand: Sigma
Index-No.: 616-001-00-X
REACH No.: 01-2119475605-32-XXXX
CAS-No.: 68-12-2

1.2 Relevant identified uses of the substance or mixture and uses advised against
Identified uses: Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet
Company: Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO  63103
USA

Telephone: +1 800-325-5832
Fax: +1 800-325-5052

1.4 Emergency telephone number
Emergency Phone #: (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture
GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 3), H226
Acute toxicity, Inhalation (Category 4), H332
Acute toxicity, Dermal (Category 4), H312
Eye irritation (Category 2A), H319
Reproductive toxicity (Category 1B), H360

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)
H226 Flammable liquid and vapour.
H312 + H332 Harmful in contact with skin or if inhaled
H319 Causes serious eye irritation.
H360 May damage fertility or the unborn child.

Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
Keep container tightly closed.
P240 Ground/bond container and receiving equipment.
P241 Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242 Use only non-sparking tools.
P243 Take precautionary measures against static discharge.
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash skin thoroughly after handling.
P271 Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P272 Use only non-sparking tools.
P273 Take precautionary measures against static discharge.
P303 + P361 + P353 IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P322 Specific measures (see supplemental first aid instructions on this label).
P337 + P313 If eye irritation persists: Get medical advice/ attention.
P363 Wash contaminated clothing before reuse.
P370 + P378 In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P403 + P235 Store in a well-ventilated place. Keep cool.
P405 Store locked up.
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS
Rapidly absorbed through skin.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms: DMF

Formula: C₃H₇NO
Molecular Weight: 73.09 g/mol
CAS-No.: 68-12-2
EC-No.: 200-679-5
Index-No.: 616-001-00-X
Registration number: 01-2119475605-32-XXXX

Hazardous components

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>N,N-Dimethylformamide</td>
<td>Flam. Liq. 3; Acute Tox. 4; Eye Irrit. 2A; Repr. 1B; H226, H312 + H332, H319, H360</td>
<td>90 - 100 %</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.
In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
no data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media
Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides, nitrogen oxides (NOx)

5.3 Advice for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
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.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters
Components with workplace control parameters
N,N-Dimethylformamide | 68-12-2 | TWA | 10 ppm | USA. ACGIH Threshold Limit Values (TLV)

Remarks
Liver damage
Substances for which there is a Biological Exposure Index or Indices (see BEI® section)
Not classifiable as a human carcinogen
Danger of cutaneous absorption

TWA | 10 ppm | USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

Skin notation

Skin designation
The value in mg/m³ is approximate.

TWA | 10 ppm | USA. NIOSH Recommended Exposure Limits

Potential for dermal absorption

Biological occupational exposure limits

Component | CAS-No. | Parameters | Value | Biological specimen | Basis
--- | --- | --- | --- | --- | ---
N,N-Dimethylformamide | 68-12-2 | N-Methylformamide | 15 mg/l | In urine | ACGIH - Biological Exposure Indices (BEI)

Remarks
End of shift (As soon as possible after exposure ceases)

N-Acetyl-S-(N-methylcarbamoyl) cysteine | 40 mg/l | In urine | ACGIH - Biological Exposure Indices (BEI)

Prior to last shift of workweek

Derived No Effect Level (DNEL)

Application Area | Exposure routes | Health effect | Value
--- | --- | --- | ---
Workers | Skin contact | Acute systemic effects | 26.3mg/kg BW/d
Workers | Inhalation | Acute systemic effects | 30 mg/m³
Workers | Skin contact | Long-term systemic effects | 3.31mg/kg BW/d
Workers | Inhalation | Long-term systemic effects | 15 mg/m³
Workers | Inhalation | Long-term local effects | 15 mg/m³
Workers | Inhalation | Acute local effects | 30 mg/m³

Predicted No Effect Concentration (PNEC)

Compartment | Value
--- | ---
Water | 30 mg/l
Soil | 16.235 mg/kg
Marine water | 3 mg/kg
Fresh water | 30 mg/l
Fresh water sediment | 25.05 mg/kg
Onsite sewage treatment plant | 123 mg/l

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.
Personal protective equipment

Eye/face protection
Face shield and safety glasses. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
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.

Full contact
Material: butyl-rubber
Minimum layer thickness: 0.3 mm
Break through time: > 480 min
Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact
Material: Chloroprene
Minimum layer thickness: 0.6 mm
Break through time: 35 min
Material tested: Camapren® (KCL 722 / Aldrich Z677493, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate, use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance
Form: liquid, clear
Colour: colourless

b) Odour
amine-like

c) Odour Threshold
no data available

d) pH
6.7

e) Melting point/freezing point
Melting point/range: -61 °C (-78 °F)

f) Initial boiling point and boiling range
153 °C (307 °F)

g) Flash point
58 °C (136 °F) - closed cup

h) Evaporation rate
no data available

i) Flammability (solid, gas)
no data available

j) Upper/lower
Upper explosion limit: 15.2 % (V)
flammability or explosive limits

Lower explosion limit: 2.2 % (V)

k) Vapour pressure
3.60 hPa (2.70 mmHg) at 20 °C (68 °F)
5.16 hPa (3.87 mmHg) at 25 °C (77 °F)

l) Vapour density
2.52 - (Air = 1.0)

m) Relative density
0.944 g/mL

n) Water solubility
completely miscible

o) Partition coefficient: n-octanol/water
log Pow: -1.01

p) Auto-ignition temperature
no data available

q) Decomposition temperature
no data available

r) Viscosity
no data available

s) Explosive properties
no data available

t) Oxidizing properties
no data available

9.2 Other safety information
Relative vapour density
2.52 - (Air = 1.0)

10. STABILITY AND REACTIVITY

10.1 Reactivity
no data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
no data available

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Other decomposition products - no data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - rat - 2,800 mg/kg
LC50 Inhalation - rat - 4 h - 9 - 15 mg/l
LD50 Dermal - rabbit - 1,500 mg/kg
no data available

Skin corrosion/irritation
Skin - Human
Result: Mild skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - rabbit
Result: Moderate eye irritation
Respiratory or skin sensitisation
no data available

Germ cell mutagenicity
mouse
lymphocyte
Mutation in mammalian somatic cells.

Carcinogenicity
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: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (N,N-Dimethylformamide)
NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
May cause congenital malformation in the fetus.

Specific target organ toxicity - single exposure
no data available

Specific target organ toxicity - repeated exposure
no data available

Aspiration hazard
no data available

Additional Information
RTECS: LQ2100000
Warning: intolerance for alcohol can occur up to 4 days after dimethylformamide exposure. N,N-dimethylformamide is considered to be a potent liver toxin. Vomiting, Diarrhoea, Abdominal pain, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish
LC50 - Oncorhynchus mykiss (rainbow trout) - 9,000 - 13,000 mg/l - 96 h
LC50 - Lepomis macrochirus (Bluegill) - 6,700 - 7,500 mg/l - 96 h
LC50 - Pimephales promelas (fathead minnow) - 10,400 - 10,800 mg/l - 96 h
LC50 - Oncorhynchus mykiss (rainbow trout) - 9,800 mg/l - 96 h
LC50 - Lepomis macrochirus (Bluegill) - 6,300 mg/l - 96 h
LC50 - Pimephales promelas (fathead minnow) - 10,600 mg/l - 96 h

Toxicity to daphnia and other aquatic invertebrates
EC50 - Daphnia magna (Water flea) - 9,600 - 13,100 mg/l - 48 h

Toxicity to algae
LC50 - Desmodesmus subspicatus (green algae) - > 500 mg/l - 96 h

12.2 Persistence and degradability
Biodegradability Result: > 90 % - Readily biodegradable.

12.3 Bioaccumulative potential
no data available

12.4 Mobility in soil
no data available
12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
no data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2265   Class: 3   Packing group: III
Proper shipping name: N,N-Dimethylformamide
Reportable Quantity (RQ): 100 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 2265   Class: 3   Packing group: III   EMS-No: F-E, S-D
Proper shipping name: N,N-DIMETHYLFORMAMIDE
Marine pollutant: No

IATA
UN number: 2265   Class: 3   Packing group: III
Proper shipping name: N,N-Dimethylformamide

15. REGULATORY INFORMATION

REACH No. : 01-2119475605-32-XXXX

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

<table>
<thead>
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<td>68-12-2</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

<table>
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Pennsylvania Right To Know Components

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New Jersey Right To Know Components

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</tr>
</tbody>
</table>

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.
16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

| Acute Tox. | Acute toxicity |
| Eye Irrit. | Eye irritation |
| Flam. Liq. | Flammable liquids |
| H226 | Flammable liquid and vapour. |
| H312 | Harmful in contact with skin. |
| H312 + H332 | Harmful in contact with skin or if inhaled |
| H319 | Causes serious eye irritation. |
| H332 | Harmful if inhaled. |
| H360 | May damage fertility or the unborn child. |

**HMIS Rating**
- Health hazard: 2
- Chronic Health Hazard: *
- Flammability: 2
- Physical Hazard: 0

**NFPA Rating**
- Health hazard: 2
- Fire Hazard: 2
- Reactivity Hazard: 0

**Further information**
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**Preparation Information**
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.9 Revision Date: 05/13/2014 Print Date: 09/12/2014