SAFETY DATA SHEET

1. Identification

Product identifier N-Nitrosodibutylamine (NDBA)

Other means of identification
- Catalog number: 1466641
- Recommended use: Specified quality tests and assay use only.
- Recommended restrictions: Not for use as a drug. Not for administration to humans or animals.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer
- Company name: U. S. Pharmacopeia
- Address: 12601 Twinbrook Parkway, Rockville, MD 20852-1790
- Website: www.usp.org
- Telephone: RS Technical Services 301-816-8129
- E-mail: RSTECH@usp.org

Emergency phone number
- CHEMTREC within US & Canada: 1-800-424-9300
- CHEMTREC outside US & Canada: +1 703-527-3887

2. Hazard(s) identification

Physical hazards
- Flammable liquids: Category 2

Health hazards
- Acute toxicity, oral: Category 3
- Acute toxicity, dermal: Category 3
- Acute toxicity, inhalation: Category 3
- Carcinogenicity: Category 2
- Specific target organ toxicity, single exposure: Category 1

Environmental hazards
- Not classified.

OSHA defined hazards
- Not classified.

Label elements

Signal word Danger

Hazard statement Highly flammable liquid and vapor. Toxic if swallowed. Toxic in contact with skin. Toxic if inhaled. Suspected of causing cancer. Causes damage to organs.

Precautionary statement

Prevention
- Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Keep container tightly closed. Use explosion-proof electrical/ventilating/lighting equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Do not breathe mist or vapor. Wash thoroughly after handling. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection.

Response
- If exposed: Call a poison center/doctor. If swallowed: Rinse mouth. If on skin (or hair): Take off immediately all contaminated clothing. Wash with plenty of water. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. In case of fire: Use appropriate media to extinguish.

Storage
- Keep cool. Store in a well-ventilated place. Keep container tightly closed. Store locked up.
Disposal
Dispose of contents/container in accordance with local/regional/national/international regulations.

Hazard(s) not otherwise classified (HNOC)
None known.

Supplemental information
None.

3. Composition/information on ingredients

<table>
<thead>
<tr>
<th>Mixture</th>
<th>Chemical name</th>
<th>Common name and synonyms</th>
<th>CAS number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Methanol</td>
<td></td>
<td>67-56-1</td>
<td>99.9</td>
</tr>
<tr>
<td></td>
<td>N-NITROSODIBUTYRAMINE</td>
<td></td>
<td>924-16-3</td>
<td>0.1</td>
</tr>
</tbody>
</table>

4. First-aid measures

Inhalation
If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing. Call a physician if symptoms develop or persist. Do not use mouth-to-mouth method if the substance is inhaled. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

Skin contact
Rinse skin with water/shower. Take off contaminated clothing and wash before reuse. If skin irritation or rash occurs: Get medical advice/attention.

Eye contact
Rinse with water. Get medical attention if irritation develops and persists.

Ingestion
Rinse mouth. If ingestion of a large amount does occur, call a poison control center immediately. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Most important symptoms/effects, acute and delayed
Not available.

Indication of immediate medical attention and special treatment needed
Provide general supportive measures and treat symptomatically.

General information
Remove from exposure. Remove contaminated clothing. For treatment advice, seek guidance from an occupational health physician or other licensed health-care provider familiar with workplace chemical exposures. In the United States, the national poison control center phone number is 1-800-222-1222. If person is not breathing, give artificial respiration. If breathing is difficult, give oxygen if available. Persons developing serious hypersensitivity (anaphylactic) reactions must receive immediate medical attention.

5. Fire-fighting measures

Suitable extinguishing media
Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).

Unsuitable extinguishing media
Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards arising from the chemical
By heating and fire, harmful vapors/gases may be formed.

Special protective equipment and precautions for firefighters
Use protective equipment appropriate for surrounding materials.

Fire fighting equipment/instructions
In case of fire and/or explosion do not breathe fumes. Move containers from fire area if you can do so without risk.

Specific methods
Use standard firefighting procedures and consider the hazards of other involved materials.

General fire hazards
Highly flammable liquid and vapor.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures
Keep unnecessary personnel away. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Wear appropriate personal protective equipment. Avoid inhalation of vapors. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. For personal protection, see section 8 of the SDS.

Methods and materials for containment and cleaning up
Absorb spillage with suitable absorbent material. Remove sources of ignition. Keep combustibles (wood, paper, oil, etc.) away from spilled material. Clean surface thoroughly to remove residual contamination. For waste disposal, see section 13 of the SDS.

Environmental precautions
Avoid discharge into drains, water courses or onto the ground.
7. Handling and storage

Precautions for safe handling
As a general rule, when handling USP Reference Standards, avoid all contact and inhalation of dust, mists, and/or vapors associated with the material. Clean equipment and work surfaces with suitable detergent or solvent after use. After removing gloves, wash hands and other exposed skin thoroughly. Select and use containment devices and personal protective equipment based on a risk assessment of material potency and exposure potential.

Conditions for safe storage, including any incompatibilities
Store in tight container as defined in the USP-NF. This material should be handled and stored per label instructions to ensure product integrity.

8. Exposure controls/personal protection

Occupational exposure limits
The following constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit. At this time, the other constituents have no known exposure limits.

<table>
<thead>
<tr>
<th>US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)</th>
<th>Components</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methanol (CAS 67-56-1)</td>
<td>PEL</td>
<td></td>
<td>260 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>200 ppm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>US. ACGIH Threshold Limit Values</th>
<th>Components</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methanol (CAS 67-56-1)</td>
<td>STEL</td>
<td></td>
<td>250 ppm</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td></td>
<td>200 ppm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>US. NIOSH: Pocket Guide to Chemical Hazards</th>
<th>Components</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methanol (CAS 67-56-1)</td>
<td>STEL</td>
<td></td>
<td>325 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>250 ppm</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td></td>
<td>260 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>200 ppm</td>
</tr>
</tbody>
</table>

Biological limit values

<table>
<thead>
<tr>
<th>ACGIH Biological Exposure Indices</th>
<th>Components</th>
<th>Value</th>
<th>Determinant</th>
<th>Specimen</th>
<th>Sampling Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methanol (CAS 67-56-1)</td>
<td>15 mg/l</td>
<td>Methanol</td>
<td>Urine</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

* - For sampling details, please see the source document.

Exposure guidelines

**US - California OELs: Skin designation**
Methanol (CAS 67-56-1) Can be absorbed through the skin.

**US - Minnesota Haz Subs: Skin designation applies**
Methanol (CAS 67-56-1) Skin designation applies.

**US - Tennessee OELs: Skin designation**
Methanol (CAS 67-56-1) Can be absorbed through the skin.

**US ACGIH Threshold Limit Values: Skin designation**
Methanol (CAS 67-56-1) Can be absorbed through the skin.

**US NIOSH Pocket Guide to Chemical Hazards: Skin designation**
Methanol (CAS 67-56-1) Can be absorbed through the skin.

Appropriate engineering controls
For laboratory operations, use good technique and limit open handling. Control exposures to below the occupational exposure level (if available). Select and use containment devices and personal protective equipment based on a risk assessment of exposure potential. Cover all containers for solutions and slurries while being transferred.

Individual protection measures, such as personal protective equipment

**Eye/face protection**
Wear safety glasses with side shields, chemical splash goggles, or full face shield, if necessary. Base the choice of protection on the job activity and potential for contact with eyes or face. An emergency eye wash station should be available.

**Skin protection**
Wear nitrile or other impervious gloves if skin contact is possible. When the material is dissolved or suspended in an organic solvent, wear gloves that provide protection against the solvent.
Other

Wear lab coat. Base the choice of skin protection on the job activity, potential for skin contact and solvents and reagents in use. Do not wear protective garments in common areas (e.g., cafeterias) or out-of-doors.

Respiratory protection

Respirators are generally not required for laboratory operations. Choose respiratory protection appropriate to the task and the level of existing engineering controls.

Thermal hazards

Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations

Handling practices in this SDS are recommendations for laboratory use of reference standards. Procedures for any other uses or quantities should be determined after an appropriate assessment.

9. Physical and chemical properties

Appearance descriptions are general information and not specific to any USP lot.

Appearance

Physical state: Liquid.
Form: Liquid.
Color: Not available.
Odor: Not available.
Odor threshold: Not available.

Melting point/freezing point:
Not available.

Initial boiling point and boiling range:
Not available.

Flash point:
Not available.

Evaporation rate:
Not available.

Flammability (solid, gas):
Not applicable.

Upper/lower flammability or explosive limits

Explosive limit - lower (%): Not available.
Explosive limit - upper (%): Not available.

Vapor pressure:
Not available.

Vapor density:
Not available.

Relative density:
Not available.

Solubility(ies)

Solubility (water): Not available.

Auto-ignition temperature:
Not available.

Decomposition temperature:
Not available.

Viscosity:
Not available.

10. Stability and reactivity

The product is stable and non-reactive under normal conditions of use, storage and transport.

Material is stable under normal conditions.

No dangerous reaction known under conditions of normal use.

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. Contact with incompatible materials.

Strong oxidizing agents.

Irritating and/or toxic fumes or gases. Emits toxic fumes under fire conditions.

11. Toxicological information

Information on likely routes of exposure

Inhalation: Toxic if inhaled. May cause damage to organs by inhalation.
Skin contact: Toxic in contact with skin.
Eye contact: Knowledge about health hazard is incomplete.
Ingestion: Toxic if swallowed.
Symptoms related to the physical, chemical, and toxicological characteristics


Information on toxicological effects

Acute toxicity

Toxic if inhaled. Toxic in contact with skin. Toxic if swallowed.

<table>
<thead>
<tr>
<th>Product</th>
<th>Species</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-Nitrosodibutylamine (NDBA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Acute</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral</td>
<td>LD50</td>
<td>Rat</td>
</tr>
<tr>
<td><strong>Components</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methanol (CAS 67-56-1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Acute</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dermal</td>
<td>LD50</td>
<td>Rabbit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Inhalation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vapor</td>
<td>LC50</td>
<td>Rat</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral</td>
<td>LD50</td>
<td>Rat</td>
</tr>
</tbody>
</table>

Skin corrosion/irritation

Knowledge about health hazard is incomplete.

Serious eye damage/eye irritation

Knowledge about health hazard is incomplete.

Local effects

Methanol

Eye irritation

Result: Negative.

Species: Rabbit

Skin irritation

Result: Negative.

Species: Rabbit

Respiratory or skin sensitization

Respiratory sensitization

Knowledge about sensitization hazard is incomplete.

Skin sensitization

Knowledge about sensitization hazard is incomplete.

Methanol

Guinea pig maximization test

Result: Negative.

Germ cell mutagenicity

Knowledge about mutagenicity is incomplete.

Mutagenicity

Methanol

Ames test (Salmonella typhimurium)

Result: Negative (+/- activation)

Mutagenicity, Chromosomal aberration assays in yeast and grasshoppers

Result: Positive.

Carcinogenicity

Suspected of causing cancer.

Nitrosamines are reasonably anticipated to be a human carcinogen based on sufficient evidence of carcinogenicity from studies in experimental animals.

Methanol

10 - 1000 ppm Carcinogenicity

Result: Negative.

Species: Rat

Test Duration: 18 months

Carcinogenicity, 25 mL/twice daily. One tumor out of 80 specimens:

Species: Mouse

Test Duration: 50 weeks
IARC Monographs. Overall Evaluation of Carcinogenicity
N-NITROSODIBUTYLAMINE (CAS 924-16-3) 2B Possibly carcinogenic to humans.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1052)
Not regulated.

US. National Toxicology Program (NTP) Report on Carcinogens
N-NITROSODIBUTYLAMINE (CAS 924-16-3) Reasonably Anticipated to be a Human Carcinogen.

Reproductive toxicity

Reproducitvity
Methanol 20000 ppm Reproductivity, Increased incidence of anomalies and maternal effects at high doses.
Species: Rat
Reproductivity, Behavioral effects in offspring; increased incidence of anomalies; maternal toxicity.
Species: Rat
Reproductivity, High doses increased fetal resorptions and malformations, including neural, cranial, and ocular defects.
Species: Mouse

Knowledge about health hazard is incomplete.

Specific target organ toxicity - single exposure
Causes damage to organs.

Specific target organ toxicity - repeated exposure
Knowledge about health hazard is incomplete.

Aspiration hazard
Knowledge about health hazard is incomplete.

12. Ecological information

Ecotoxicity

<table>
<thead>
<tr>
<th>Components</th>
<th>Species</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methanol (CAS 67-56-1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquatic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crustacea</td>
<td>EC50</td>
<td>Water flea (Daphnia magna) &gt; 10000 mg/l, 48 hours</td>
</tr>
<tr>
<td>Fish</td>
<td>LC50</td>
<td>Fathead minnow (Pimephales promelas) &gt; 100 mg/l, 96 hours</td>
</tr>
</tbody>
</table>

Persistence and degradability
No data is available on the degradability of any ingredients in the mixture.

Bioaccumulative potential

Octanol/water partition coefficient log Kow

<table>
<thead>
<tr>
<th>Components</th>
<th>Log Kow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methanol</td>
<td>-0.77</td>
</tr>
<tr>
<td>N-NITROSODIBUTYLAMINE</td>
<td>1.92</td>
</tr>
</tbody>
</table>

Mobility in soil
No data available.

Other adverse effects
The product contains volatile organic compounds which have a photochemical ozone creation potential.

13. Disposal considerations

Disposal instructions
Dispose in accordance with all applicable regulations. Under RCRA, it is the responsibility of the user of the product to determine, at the time of disposal, whether the product meets RCRA criteria for hazardous waste.

Local disposal regulations
Dispose in accordance with all applicable regulations.

Hazardous waste code
D001: Waste Flammable material with a flash point <140 F
U172: Waste 1-Butanamine, N-butyl-N-nitroso-
U154: Waste Methyl alcohol
The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products
Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging
Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT
UN number
UN1230
UN proper shipping name
Methanol, solution (Methanol RQ = 5005 LBS)
Transport hazard class(es)

Class: 3
Subsidiary risk: -
Packing group: II
Packaging exceptions: 150
Packaging non bulk: 202
Packaging bulk: 242

IATA

UN number: UN1230
UN proper shipping name: Methanol solution (Methanol)

DOT

General information

It is the shipper's responsibility to determine the correct transport classification at the time of shipment.

15. Regulatory information

US federal regulations

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Methanol (CAS 67-56-1)  Listed.
N-NITROSOBUTYLAMINE (CAS 924-16-3)  Listed.

SARA 304 Emergency release notification

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1052)

Not regulated.
Superfund Amendments and Reauthorization Act of 1986 (SARA)
SARA 302 Extremely hazardous substance
Not listed.
SARA 311/312 Hazardous chemical
Classified hazard categories
- Flammable (gases, aerosols, liquids, or solids)
- Acute toxicity (any route of exposure)
- Carcinogenicity
- Specific target organ toxicity (single or repeated exposure)

SARA 313 (TRI reporting)
<table>
<thead>
<tr>
<th>Chemical name</th>
<th>CAS number</th>
<th>% by wt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methanol</td>
<td>67-56-1</td>
<td>99.9</td>
</tr>
<tr>
<td>N-NITROSODIBUTYLAMINE</td>
<td>924-16-3</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Other federal regulations
Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List
Methanol (CAS 67-56-1)
Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)
Not regulated.
Safe Drinking Water Act (SDWA)
Not regulated.

US state regulations
California Proposition 65
WARNING: This product can expose you to N-NITROSODIBUTYLAMINE, which is known to the State of California to cause cancer, and Methanol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.
California Proposition 65 - CRT: Listed date/Carcinogenic substance
N-NITROSODIBUTYLAMINE (CAS 924-16-3) Listed: October 1, 1987
California Proposition 65 - CRT: Listed date/Developmental toxin
Methanol (CAS 67-56-1) Listed: March 16, 2012
US. California. Candidate Chemicals List. Safer Consumer Products Regulations (Cal. Code Regs, tit. 22, 69502.3, subd. (a))
Methanol (CAS 67-56-1)
N-NITROSODIBUTYLAMINE (CAS 924-16-3)

International Inventories
<table>
<thead>
<tr>
<th>Country(s) or region</th>
<th>Inventory name</th>
<th>On inventory (yes/no)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Australian Inventory of Chemical Substances (AICS)</td>
<td>No</td>
</tr>
<tr>
<td>Canada</td>
<td>Domestic Substances List (DSL)</td>
<td>No</td>
</tr>
<tr>
<td>Canada</td>
<td>Non-Domestic Substances List (NDSL)</td>
<td>Yes</td>
</tr>
<tr>
<td>China</td>
<td>Inventory of Existing Chemical Substances in China (IECSC)</td>
<td>No</td>
</tr>
<tr>
<td>Europe</td>
<td>European Inventory of Existing Commercial Chemical Substances (EINECS)</td>
<td>Yes</td>
</tr>
<tr>
<td>Europe</td>
<td>European List of Notified Chemical Substances (ELINCS)</td>
<td>No</td>
</tr>
<tr>
<td>Japan</td>
<td>Inventory of Existing and New Chemical Substances (ENCS)</td>
<td>No</td>
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<tr>
<td>Korea</td>
<td>Existing Chemicals List (ECL)</td>
<td>No</td>
</tr>
<tr>
<td>New Zealand</td>
<td>New Zealand Inventory</td>
<td>No</td>
</tr>
<tr>
<td>Philippines</td>
<td>Philippine Inventory of Chemicals and Chemical Substances (PICCS)</td>
<td>No</td>
</tr>
<tr>
<td>Taiwan</td>
<td>Taiwan Chemical Substance Inventory (TCSI)</td>
<td>Yes</td>
</tr>
<tr>
<td>United States &amp; Puerto Rico</td>
<td>Toxic Substances Control Act (TSCA) Inventory</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision
Issue date 02-06-2020
Version # 01
Material name: N-Nitrosodibutylamine (NDBA)

1466641  Version #: 01  Issue date: 02-06-2020