

SAFETY DATA SHEET

Piperazine

According to the REACH etc. (Amendment etc.) (EU Exit) Regulations 2020 No. 1577, as amended.

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name Piperazine

Chemical name Diethylenediamine

Synonyms; trade names 1,4-Diazacyclohexane

CAS number 110-85-0

EU index number 612-057-00-4

EC number 203-808-3

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses Research and development.

Uses advised against Not suitable for human consumption or veterinary purposes.

1.3. Details of the supplier of the safety data sheet

Supplier Molekula Ltd.

Lingfield Way, Darlington, DL1 4XX, United Kingdom +44 (0) 3302000333 info@molekula.com

1.4. Emergency telephone number

+44 (0) 7769276927

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification (SI 2019 No. 720)

Physical hazards Flam. Sol. 1 - H228

Health hazards Skin Corr. 1B - H314 Eye Dam. 1 - H318 Resp. Sens. 1 - H334 Skin Sens. 1 - H317 Repr. 2 -

H361

Environmental hazards Not Classified

2.2. Label elements

EC number 203-808-3

Hazard pictograms







Piperazine

Signal word Danger

Hazard statements H228 Flammable solid.

H314 Causes severe skin burns and eye damage.

H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled.

H317 May cause an allergic skin reaction.

H361 Suspected of damaging fertility or the unborn child.

Precautionary statements P201 Obtain special instructions before use.

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

P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No

smoking.

P240 Ground and bond container and receiving equipment.

P241 Use explosion-proof electrical equipment.

P260 Do not breathe dust.

P264 Wash contaminated skin thoroughly after handling.

P272 Contaminated work clothing should not be allowed out of the workplace.

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

P284 [In case of inadequate ventilation] wear respiratory protection.

P301+P330+P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

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

P303+P361+P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing.

Rinse skin with water or shower.

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

P310 Immediately call a POISON CENTER/ doctor.

P333+P313 If skin irritation or rash occurs: Get medical advice/ attention.

P342+P311 If experiencing respiratory symptoms: Call a POISON CENTER/ doctor.

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

P363 Wash contaminated clothing before reuse.

P405 Store locked up.

P501 Dispose of contents/ container in accordance with national regulations.

2.3. Other hazards

This substance is not classified as PBT or vPvB according to current UK criteria.

SECTION 3: Composition/information on ingredients

3.1. Substances

Product name Piperazine

Chemical name Diethylenediamine

EU index number 612-057-00-4

 CAS number
 110-85-0

 EC number
 203-808-3

Chemical formula C4H10N2

SECTION 4: First aid measures

4.1. Description of first aid measures

General information Get medical attention if any discomfort continues. Show this Safety Data Sheet to the medical

personnel. Chemical burns must be treated by a physician.

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Inhalation Move affected person to fresh air and keep warm and at rest in a position comfortable for

breathing. Maintain an open airway. Loosen tight clothing such as collar, tie or belt. Rinse nose and mouth with water. Never give anything by mouth to an unconscious person. Get medical attention if symptoms are severe or persist. In the event of any sensitisation

symptoms developing, ensure further exposure is avoided.

Ingestion Rinse mouth thoroughly with water. Give a few small glasses of water or milk to drink. Stop if

the affected person feels sick as vomiting may be dangerous. Get medical attention.

Skin contact It is important to remove the substance from the skin immediately. Rinse immediately with

plenty of water. Continue to rinse for at least 15 minutes and get medical attention. Chemical

burns must be treated by a physician.

Eye contact Rinse immediately with plenty of water. Do not rub eye. Remove any contact lenses and open

eyelids wide apart. Continue to rinse for at least 15 minutes and get medical attention.

Protection of first aidersIt may be dangerous for first aid personnel to carry out mouth-to-mouth resuscitation.

4.2. Most important symptoms and effects, both acute and delayed

General information The severity of the symptoms described will vary dependent on the concentration and the

length of exposure.

Inhalation May cause sensitisation or allergic reactions in sensitive individuals. A single exposure may

cause the following adverse effects: Severe irritation of nose and throat. Symptoms following

overexposure may include the following: Corrosive to the respiratory tract.

Ingestion May cause sensitisation or allergic reactions in sensitive individuals. May cause chemical

burns in mouth, oesophagus and stomach. Symptoms following overexposure may include

the following: Severe stomach pain. Nausea, vomiting.

Skin contact May cause skin sensitisation or allergic reactions in sensitive individuals. Causes severe

burns. Symptoms following overexposure may include the following: Pain or irritation.

Redness. Blistering may occur.

Eye contact Causes serious eye damage. Symptoms following overexposure may include the following:

Pain. Profuse watering of the eyes. Redness.

4.3. Indication of any immediate medical attention and special treatment needed

Notes for the doctor Treat symptomatically. May cause sensitisation or allergic reactions in sensitive individuals.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media The product is flammable. Extinguish with alcohol-resistant foam, carbon dioxide, dry powder

or water fog. Use fire-extinguishing media suitable for the surrounding fire.

Unsuitable extinguishing

media

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

5.2. Special hazards arising from the substance or mixture

Specific hazards Flammable solid. Dust may form explosive mixture with air. Fire-water run-off in sewers may

create fire or explosion hazard. Severe corrosive hazard. Water used for fire extinguishing,

which has been in contact with the product, may be corrosive.

Hazardous combustion

products

Thermal decomposition or combustion products may include the following substances: Very toxic or corrosive gases or vapours. Carbon monoxide (CO). Carbon dioxide (CO2). Nitrous

gases (NOx).

5.3. Advice for firefighters

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Protective actions during firefighting

Avoid breathing fire gases or vapours. Evacuate area. Keep upwind to avoid inhalation of gases, vapours, fumes and smoke. Cool containers exposed to heat with water spray and remove them from the fire area if it can be done without risk. Cool containers exposed to flames with water until well after the fire is out. Avoid discharge to the aquatic environment. Control run-off water by containing and keeping it out of sewers and watercourses. If risk of water pollution occurs, notify appropriate authorities.

Special protective equipment for firefighters

Regular protection may not be safe. Wear chemical protective suit. Wear positive-pressure self-contained breathing apparatus (SCBA) and appropriate protective clothing. Firefighter's clothing will provide a basic level of protection for chemical incidents.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions

Wear protective clothing as described in Section 8 of this safety data sheet. No action shall be taken without appropriate training or involving any personal risk. Do not touch or walk into spilled material. Evacuate area. Provide adequate ventilation. No smoking, sparks, flames or other sources of ignition near spillage. Promptly remove any clothing that becomes contaminated. Avoid inhalation of dust. Use suitable respiratory protection if ventilation is inadequate. Avoid contact with skin and eyes.

6.2. Environmental precautions

Environmental precautions

Avoid discharge into drains or watercourses or onto the ground. Avoid discharge to the aquatic environment. Risk of explosion

6.3. Methods and material for containment and cleaning up

Methods for cleaning up

Wear protective clothing as described in Section 8 of this safety data sheet. Clear up spills immediately and dispose of waste safely. Eliminate all ignition sources if safe to do so. No smoking, sparks, flames or other sources of ignition near spillage. Do not allow material to enter confined spaces, due to the risk of explosion. This product is corrosive. Collect spillage with a shovel and broom, or similar and reuse, if possible. Collect and place in suitable waste disposal containers and seal securely. Flush contaminated area with plenty of water. Wash thoroughly after dealing with a spillage. For waste disposal, see Section 13.

6.4. Reference to other sections

Reference to other sections

For personal protection, see Section 8. See Section 11 for additional information on health hazards. See Section 12 for additional information on ecological hazards. For waste disposal, see Section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Usage precautions

Read and follow manufacturer's recommendations. Wear protective clothing as described in Section 8 of this safety data sheet. Keep away from food, drink and animal feeding stuffs. Keep container tightly sealed when not in use. The product is flammable. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. This product is corrosive. Immediate first aid is imperative. Suspected of damaging fertility. Suspected of damaging the unborn child. Pregnant or breastfeeding women should not work with this product if there is any risk of exposure. Do not handle until all safety precautions have been read and understood. Do not handle broken packages without protective equipment. Do not reuse empty containers.

Advice on general occupational hygiene

Wash promptly if skin becomes contaminated. Take off contaminated clothing. Wash contaminated clothing before reuse.

7.2. Conditions for safe storage, including any incompatibilities

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Storage precautions Store away from incompatible materials (see Section 10). Store locked up. Keep away from

> oxidising materials, heat and flames. Keep only in the original container. Keep container tightly closed, in a cool, well ventilated place. Keep containers upright. Protect containers from

damage.

Air and light sensitive. Store under inert gas.

Storage class Flammable solid hazardous substances

7.3. Specific end use(s)

Specific end use(s) The identified uses for this product are detailed in Section 1.2.

SECTION 8: Exposure controls/Personal protection

8.1. Control parameters

Occupational exposure limits

Long-term exposure limit (8-hour TWA): WEL 0.1 mg/m³ Short-term exposure limit (15-minute): WEL 0.3 mg/m³ Sen

WEL = Workplace Exposure Limit.

Sen = Capable of causing occupational asthma.

PNEC Fresh water; 1.25 mg/l

> Sediment (Freshwater); 4.5 mg/l Sediment (Marinewater); 0.45 mg/kg

Soil; 11.5 mg/kg STP; 54 mg/l

8.2. Exposure controls

Protective equipment













Appropriate engineering controls

Provide adequate general and local exhaust ventilation. Ensure the ventilation system is regularly maintained and tested. Good general ventilation should be adequate to control worker exposure to airborne contaminants. Observe any occupational exposure limits for the product or ingredients.

Eye/face protection Wear tight-fitting, chemical splash goggles or face shield. If inhalation hazards exist, a full-

face respirator may be required instead.

Hand protection For exposure up to 8 hours, wear gloves made of the following material: Nitrile rubber.

Thickness: 0.11 mm

To protect hands from chemicals, wear gloves that are proven to be impervious to the chemical and resist degradation. Considering the data specified by the glove manufacturer, check during use that the gloves are retaining their protective properties and change them as

soon as any deterioration is detected. Frequent changes are recommended.

Other skin and body protection

Wear appropriate clothing to prevent any possibility of skin contact.

Hygiene measures Wash after use and before eating, smoking and using the toilet. Do not eat, drink or smoke

when using this product.

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Respiratory protection Ensure all respiratory protective equipment is suitable for its intended use and is 'UKCA'-

marked. Check that the respirator fits tightly and the filter is changed regularly. Gas and combination filter cartridges suitable for intended use should be used. Full face mask respirators with replaceable filter cartridges suitable for intended use should be used. Half mask and quarter mask respirators with replaceable filter cartridges suitable for intended use

should be used.

Environmental exposure

controls

Keep container tightly sealed when not in use. Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance Powder.

Colour White/off-white.

Odour Amine.

Odour threshold No information available.

pH (diluted solution): 12, 150g/l (20°C/68°F)

Melting point 106 - 110°C/222.8 - 230°F

Initial boiling point and range 145 - 146°C/293 - 294.8°F @ 1013 hPa

Flash point

No information available.

Evaporation rate

No information available.

Flammability (solid, gas)

No information available.

Upper/lower flammability or

explosive limits

Vapour density

Upper flammable/explosive limit: 14% Lower flammable/explosive limit: 4%

No information available.

Vapour pressure 0.21 hPa @ 20°C/68°F

Relative density 1.1

Solubility(ies) 150 g/l water @ 20°C/68°F

Soluble in the following materials: Alcohols. Chloroform.

Partition coefficient

No information available.

Auto-ignition temperature

No information available.

Decomposition Temperature

No information available.

9.2. Other information

Molecular weight 86.14

SECTION 10: Stability and reactivity

10.1. Reactivity

Reactivity This is a combustible organic substance. The risk of a dust explosion may be assumed when

the substance is finely distributed.

10.2. Chemical stability

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Stable at normal ambient temperatures and when used as recommended. Stable under the

prescribed storage conditions.

10.3. Possibility of hazardous reactions

Possibility of hazardous

reactions

Caution! In contact with nitrites, nitrates, nitrous acid possible liberation of nitrosamines!

Violent reactions possible with:

Acids.

Strong oxidising agents.

10.4. Conditions to avoid

Conditions to avoid Avoid generation and spreading of dust. Avoid dust close to ignition sources.

Avoid heat, flames and other sources of ignition. Static electricity and formation of sparks

must be prevented.

Protect from moisture.

10.5. Incompatible materials

Materials to avoid Avoid contact with strong oxidising agents. Strong acids.

10.6. Hazardous decomposition products

Hazardous decomposition

products

Does not decompose when used and stored as recommended. Thermal decomposition or combustion products may include the following substances: Corrosive gases or vapours.

Carbon monoxide (CO). Carbon dioxide (CO2). Nitrous gases (NOx).

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity - oral

Summary Based on available data the classification criteria are not met.

Acute toxicity oral (LD₅o

mg/kg)

2,600.0

Species Rat

ATE oral (mg/kg) 2,600.0

Acute toxicity - dermal

Summary Based on available data the classification criteria are not met.

Acute toxicity dermal (LD₅

mg/kg)

8,300.0

Species Rabbit

ATE dermal (mg/kg) 8,300.0

Acute toxicity - inhalation

Summary Based on available data the classification criteria are not met.

Skin corrosion/irritation

Summary Causes severe skin burns and eye damage.

Serious eye damage/irritation

Summary Causes serious eye damage.

Respiratory sensitisation

Summary May cause allergy or asthma symptoms or breathing difficulties if inhaled.

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Skin sensitisation

Summary May cause an allergic skin reaction.

Germ cell mutagenicity

Summary Based on available data the classification criteria are not met.

Carcinogenicity

Summary Based on available data the classification criteria are not met.

IARC carcinogenicityNone of the ingredients are listed or exempt.

Reproductive toxicity

Summary Suspected of damaging the unborn child. Suspected of damaging fertility.

Specific target organ toxicity - single exposure

Summary Based on available data the classification criteria are not met.

Specific target organ toxicity - repeated exposure

Summary Based on available data the classification criteria are not met.

Aspiration hazard

Summary Not relevant. Solid.

General information Avoid contact during pregnancy/while nursing. May damage fertility. The severity of the

symptoms described will vary dependent on the concentration and the length of exposure.

Inhalation May cause sensitisation or allergic reactions in sensitive individuals. Corrosive to the

respiratory tract. Symptoms following overexposure may include the following: Severe

irritation of nose and throat.

Ingestion May cause sensitisation or allergic reactions in sensitive individuals. May cause chemical

burns in mouth, oesophagus and stomach. Symptoms following overexposure may include

the following: Severe stomach pain. Nausea, vomiting.

Skin contact May cause skin sensitisation or allergic reactions in sensitive individuals. Causes severe

burns. Symptoms following overexposure may include the following: Pain or irritation.

Redness. Blistering may occur.

Eye contact Causes serious eye damage. Symptoms following overexposure may include the following:

Pain. Profuse watering of the eyes. Redness.

Route of exposure Ingestion Inhalation Skin and/or eye contact

Target organs No specific target organs known.

Medical considerations Skin disorders and allergies.

SECTION 12: Ecological information

Ecotoxicity Not regarded as dangerous for the environment. However, large or frequent spills may have

hazardous effects on the environment.

12.1. Toxicity

Acute aquatic toxicity

Summary Based on available data the classification criteria are not met.

Acute toxicity - fish LC₅₀, 96 hours: > 100 mg/l, Oryzias latipes (Red killifish)

Acute toxicity - aquatic

invertebrates

EC₅o, 48 hours: 105.4 mg/l, Daphnia magna

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Acute toxicity - aquatic plants EC₅₀, 72 hours: 153.1 mg/l, Pseudokirchneriella subcapitata

Chronic aquatic toxicity

Summary Based on available data the classification criteria are not met.

12.2. Persistence and degradability

Persistence and degradability 65%, 28 days The product is readily biodegradable.

12.3. Bioaccumulative potential

Bioaccumulative potential No data available on bioaccumulation.

Partition coefficient No information available.

12.4. Mobility in soil

Mobility No data available.

12.5. Results of PBT and vPvB assessment

12.6. Other adverse effects

Other adverse effects None known.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

General information The generation of waste should be minimised or avoided wherever possible. Reuse or recycle

products wherever possible. This material and its container must be disposed of in a safe way. When handling waste, the safety precautions applying to handling of the product should be considered. Care should be taken when handling emptied containers that have not been thoroughly cleaned or rinsed out. Empty containers or liners may retain some product

residues and hence be potentially hazardous.

Disposal methodsDo not empty into drains. Dispose of surplus products and those that cannot be recycled via a

licensed waste disposal contractor. Waste, residues, empty containers, discarded work clothes and contaminated cleaning materials should be collected in designated containers, labelled with their contents. Incineration or landfill should only be considered when recycling is

not feasible.

SECTION 14: Transport information

General For limited quantity packaging/limited load information, consult the relevant modal

documentation using the data shown in this section.

14.1. UN number

UN No. (ADR/RID) 2579

UN No. (IMDG) 2579

UN No. (ICAO) 2579

UN No. (ADN) 2579

14.2. UN proper shipping name

Proper shipping name

PIPERAZINE

(ADR/RID)

Proper shipping name (IMDG) PIPERAZINE

Proper shipping name (ICAO) PIPERAZINE

Proper shipping name (ADN) PIPERAZINE

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14.3. Transport hazard class(es)

ADR/RID class 8

ADR/RID classification code C8

ADR/RID label 8

IMDG class 8

ICAO class/division 8

ADN class 8

Transport labels



14.4. Packing group

ADR/RID packing group III
IMDG packing group III
ICAO packing group III
ADN packing group III

14.5. Environmental hazards

Environmentally hazardous substance/marine pollutant

No.

14.6. Special precautions for user

Always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

IMDG Code segregation 18. Alkalis

group

EmS F-A, S-B

ADR transport category 3

Emergency Action Code 2X

Hazard Identification Number 80

(ADR/RID)

Tunnel restriction code (E)

14.7. Transport in bulk according to Annex II of MARPOL and the IBC Code

Transport in bulk according to Not applicable.

Annex II of MARPOL 73/78

and the IBC Code

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations Health and Safety at Work etc. Act 1974 (as amended).

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment

Regulations 2009 (SI 2009 No. 1348) (as amended) ["CDG 2009"].

EH40/2005 Workplace exposure limits.

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15.2. Chemical safety assessment

No chemical safety assessment has been carried out.

Inventories

EU - EINECS/ELINCS

None of the ingredients are listed or exempt.

SECTION 16: Other information

Abbreviations and acronyms used in the safety data sheet

ADR: European Agreement concerning the International Carriage of Dangerous Goods by

Road.

ADN: European Agreement concerning the International Carriage of Dangerous Goods by

Inland Waterways.

RID: European Agreement concerning the International Carriage of Dangerous Goods by Rail.

IATA: International Air Transport Association.

ICAO: Technical Instructions for the Safe Transport of Dangerous Goods by Air.

IMDG: International Maritime Dangerous Goods.

CAS: Chemical Abstracts Service. ATE: Acute Toxicity Estimate.

LC50: Lethal Concentration to 50 % of a test population.

LD50: Lethal Dose to 50% of a test population (Median Lethal Dose).

EC50: 50% of maximal Effective Concentration.

PBT: Persistent, Bioaccumulative and Toxic substance. vPvB: Very Persistent and Very Bioaccumulative.

Classification abbreviations

and acronyms

Flam. Sol. = Flammable solid Eye Dam. = Serious eye damage

Resp. Sens. = Respiratory sensitisation

Repr. = Reproductive toxicity Skin Corr. = Skin corrosion Skin Sens. = Skin sensitisation

Classification procedures according to SI 2019 No. 720

Eye Dam. 1 - H318: Skin Corr. 1B - H314: Resp. Sens. 1 - H334: Skin Sens. 1 - H317: Repr.

2 - H361: : Expert judgement. Flam. Sol. 1 - H228: : Expert judgement.

Training advice Only trained personnel should use this material.

Revision date 08/11/2022

Revision 1

SDS number 1746

Hazard statements in full H228 Flammable solid.

H314 Causes severe skin burns and eye damage.

H317 May cause an allergic skin reaction. H318 Causes serious eye damage.

H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled.

H361 Suspected of damaging fertility or the unborn child.

This information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Such information is, to the best of the company's knowledge and belief, accurate and reliable as of the date indicated. However, no warranty, guarantee or representation is made to its accuracy, reliability or completeness. It is the user's responsibility to satisfy himself as to the suitability of such information for his own particular use.