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

1.1. Product identifier

Product name
Nitric oxide, compressed

EC No (from EINECS): 233-271-0
CAS No: 10102-43-9
Index-Nr.

Chemical formula
NO

REACH Registration number
Not available.

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

Relevant identified uses
Industrial and professional. Perform risk assessment prior to use.

Uses advised against
Consumer use.

1.3. Details of the supplier of the safety data sheet

Company identification
BOC, Priestley Road, Worsley, Manchester M28 2UT
E-Mail Address ReacchSDS@boc.com

1.4. Emergency telephone number

Emergency phone numbers (24h):
0800 111 333

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification acc. to Regulation (EC) No 1272/2008/EC (CLP/GHS)

Press. Gas (Compressed gas) - Contains gas under pressure; may explode if heated.
Ox. Gas 1 - May cause or intensify fire; oxidiser. Acute Tox. 1 - Fatal if inhaled. Skin Corr. 1B - Causes severe skin burns and eye damage. EUH071 - Corrosive to the respiratory tract.

T+; R26 | C; R34 | O; R8
Very toxic by inhalation.
Causes burns (to eyes, respiratory system and skin). Contact with combustible material may cause fire.
Risk advice to man and the environment
In high concentrations may cause asphyxiation. Compressed gas.

2.2. Label elements

- Labelling Pictograms

- Signal word
Danger

- Hazard Statements
H280 Contains gas under pressure; may explode if heated.
H270 May cause or intensify fire; oxidiser.
H330 Fatal if inhaled.
H314 Causes severe skin burns and eye damage.
EUH071 Corrosive to the respiratory tract.

- Precautionary Statements

Precautionary Statement Prevention
P244 Keep valves and fittings free from oil and grease.
P260 Do not breathe gas, vapours.
P220 Keep away from combustible materials.
P280 Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary Statement Response
P304+P340+P315 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get immediate medical advice/attention.
P303+P361+P353+P315 IF ON SKIN (or hair): Remove / Take off immediately all contaminated clothes. Rinse skin with water/shower. Get immediate medical advice/attention.
P305+P351+P338+P315 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice/attention.
P370 + P376 In case of fire: Stop leak if safe to do so.

Precautionary Statement Storage
P403 Store in a well-ventilated place.
P405 Store locked up.

Precautionary Statement Disposal
None.

2.3. Other hazards
None.

SECTION 3: Composition/information on ingredients

Substance / Mixture: Substance.

3.1. Substances
Nitric oxide, compressed
CAS No: 10102-43-9
Index-Nr.. EC No (from EINECS): 233-271-0
REACH Registration number:
Not available.
Contains no other components or impurities which will influence the classification of the product.

3.2. Mixtures
Not applicable.

SECTION 4: First aid measures

4.1. Description of first aid measures

First Aid General Information:
Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

First Aid Inhalation:
Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
Safety data sheet
Nitric oxide, compressed

First Aid Skin / Eye:
Remove contaminated clothing. Drench affected area with water for at least 15 minutes. Immediately flush eyes thoroughly with water for at least 15 minutes.

First Aid Ingestion:
Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed
Delayed adverse effects possible. May cause severe chemical burns to skin and cornea. Suitable first-aid treatment should be immediately available. Seek medical advice before using product. Prolonged exposure to small concentrations may result in pulmonary oedema.

4.3. Indication of any immediate medical attention and special treatment needed
Treat with a corticosteroid spray as soon as possible after inhalation. Obtain medical assistance. Absorption of nitric oxide may lead to the formation of methemoglobin, and a conversion fraction of 10% may be noted as a "lilac" cyanosis. High levels of conversion (>35-40%) may be indications for treatment with intravenous methylene blue or exchange transfusion.

SECTION 5: Fire fighting measures

5.1. Extinguishing media
Suitable extinguishing media
All known extinguishants can be used.

5.2. Special hazards arising from the substance or mixture
Specific hazards
Supports combustion. Exposure to fire may cause containers to rupture/explode.

Hazardous combustion products
None that are more toxic than the product itself.

5.3. Advice for fire-fighters
Specific methods
If possible, stop flow of product. Move container away or cool with water from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems.

Special protective equipment for fire-fighters
Gas tight chemically protective clothing (Type 1) in combination with self contained breathing apparatus.

Guideline:
EN 943-2:2002: Protective clothing against liquid and gaseous chemicals, aerosols and solid particles. Performance requirements for gas-tight (Type 1) chemical protective suits for emergency teams (ET).

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Evacuate area. Ensure adequate air ventilation. Eliminate ignition sources. Use self-contained breathing apparatus and chemically protective clothing. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous. Monitor concentration of released product. EN 137 Respiratory protective devices — Self-contained open-circuit compressed air breathing apparatus with full face mask — Requirements, testing, marking.

6.2. Environmental precautions
Try to stop release. Reduce vapour with fog or fine water spray. Monitor concentration of released product.

6.3. Methods and material for containment and cleaning up
Ventilate area. Wash contaminated equipment or sites of leaks with copious quantities of water. Hose down area with water.

6.4. Reference to other sections
See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling
Only experienced and properly instructed persons should handle gases under pressure. The substance must be handled in accordance with good industrial hygiene and safety procedures. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt. Avoid exposure, obtain special instructions before use. Use no oil or grease. Do not smoke while handling product. Keep equipment free from oil and grease. Ensure the complete gas system has been (or is regularly) checked for leaks before use. Installation of a cross purge assembly between the container and the regulator is recommended. Purge system with dry inert gas (e.g. helium or nitrogen) before gas is introduced and when system is placed out of service. Avoid suckback of water, acid and alkalis. Do not allow backfeed into the container. Open valve slowly to avoid pressure shock. Refer to supplier's handling instructions. Protect containers from physical damage; do not drag, roll, slide or drop. When moving containers, even for short distances, use appropriate equipment eg. trolley, hand truck, fork truck etc. Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use. If user experiences any difficulty operating container valve discontinue use and contact supplier. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Keep container valve outlets clean and free from contaminates particularly oil and water. Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to transfer gases from one container to another. Never use direct flame or electrical heating devices to raise the pressure of a container. Do not remove or deface labels provided by the supplier for the identification of the container contents.

7.2. Conditions for safe storage, including any incompatibilities
Keep container below 50°C in a well ventilated place. Segregate from flammable gases and other flammable materials in store. Observe all regulations and local requirements regarding storage of containers. Cylinders should be stored in the vertical position and properly secured to prevent falling over. Stored containers should be periodically checked for general conditions and leakage. Container valve guards or caps should be in place. Store containers in location free from fire risk and away from sources of heat and ignition. Keep away from combustible materials. Containers should not be stored in conditions likely to encourage corrosion.

7.3. Specific end use(s)
None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters
Exposure limit value
<table>
<thead>
<tr>
<th>Value type</th>
<th>value</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLV (ACGIH)</td>
<td>25 ppm</td>
<td>2011</td>
</tr>
</tbody>
</table>
8.2. Exposure controls

Appropriate engineering controls
A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product and to select the PPE that matches the relevant risk. The following recommendations should be considered. Keep concentrations well below occupational exposure limits. Product to be handled in a closed system and under strictly controlled conditions. Consider work permit system e.g. for maintenance activities. Preferably use permanent leak-tight connections (e.g. welded pipes). Systems under pressure should be regularly checked for leakages. Provide adequate general or local ventilation. Gas detectors should be used when toxic quantities may be released. Gas detectors should be used when quantities of oxidising gases may be released.

Personal protective equipment

Eye and face protection
Protect eyes, face and skin from contact with product. Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Wear goggles and a face-shield when transferring or breaking transfer connections Wear eye protection to EN 166 when working period. Wear goggles and a face-shield when transferring or breaking transfer connections.

Hand protection
Advice: Wear working gloves and safety shoes while handling containers. Chemically resistant gloves complying with EN 374 should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Guideline: EN 374-1/2/3 Protective gloves against chemicals and micro-organisms.

Body protection
Protect eyes, face and skin from contact with product. Keep suitable chemically resistant protective clothing readily available for emergency use. Personal protective equipment for the body should be selected based on the task being performed and the risks involved. Guideline: EN 943: Protective clothing against liquid and gaseous chemicals, including liquid aerosols and solid particles.

Other protection
Wear working gloves and safety shoes while handling containers. EN ISO 20345 Personal protective equipment - Safety footwear.

Respiratory protection
Keep self contained breathing apparatus readily available for emergency use. Use SCBA in the event of high concentrations. The selection of the Respiratory Protective Device (RPD) must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected RPD. When allowed by a risk assessment a supplied air respirator may be used. Guideline: EN 136 Respiratory protective devices. Full face masks. Requirements, testing, marking.

Guideline: EN 137 Respiratory protective devices — Self-contained open-circuit compressed air breathing apparatus with full face mask — Requirements, testing, marking.

Thermal hazards
No precautionary measures are necessary.

Environmental Exposure Controls
Specific risk management measures are not required beyond good industrial hygiene and safety procedures. Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

General information
Appearance/Colour: Brownish gas
Odour: Poor warning properties at low concentrations.
Odour threshold: Odour threshold is subjective and inadequate to warn for over exposure.

Melting point: -164 °C
Boiling point: -152 °C
Flash point: Not applicable for gases and gas mixtures.
Evaporation rate: Not applicable for gases and gas mixtures.
Flammability range: Non flammable.
Vapour Pressure 20 °C: Not applicable.
Relative density, gas: 1
Solubility in water: 67 mg/l
Partition coefficient: n-octanol/water: Not applicable.
Autoignition temperature: Not applicable.
Oxidising properties: Oxidiser.
Molecular weight: 30 g/mol
Critical temperature: -93 °C
Relative density, liquid: 1.3

9.2. Other information
Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

SECTION 10: Stability and reactivity

10.1. Reactivity
Unreactive under normal conditions.

10.2. Chemical stability
Stable under normal conditions. Decomposes at room temperature to other nitrogen oxides and nitrogen. Oxidises in air to form nitrogen dioxide which is extremely reactive.

10.3. Possibility of hazardous reactions
Violently oxidises organic material.

10.4. Conditions to avoid
Heat.

10.5. Incompatible materials
Air. Oxidiser. May react violently with reducing agents. May react violently with combustible materials. For material compatibility see latest version of ISO-11114.

10.6. Hazardous decomposition products
Under normal conditions of storage and use, hazardous decomposition products should not be produced. Decomposes at room temperature to other nitrogen oxides and nitrogen. Oxidises in air to form nitrogen dioxide which is extremely reactive.

SECTION 11: Toxicological information

11.1. Information on toxicological effects
Acute oral toxicity
No data available.
Acute inhalation toxicity
Value: LC50
Species: Rat
Exposure time: 1 h
Value in non-standard unit: 115 ppm
Value: LC50
Species: Rat
Exposure time: 4 h
Value in non-standard unit: 57.5 ppm
Delayed fatal pulmonary oedema possible., May be fatal if inhaled.
Skin irritation
Severe corrosion to the skin at high concentrations.
Eye irritation
Severe corrosion to the eyes at high concentrations.
Sensitization
No known effects from this product.
Genetic toxicity in vitro
Test type: In vitro gene mutations test on mammalian cells: Mutagenic
Test type: Ames test in vitro: Mutagenic
Assessment carcinogenicity
No known effects from this product.
Assessment toxicity to reproduction
No known effects from this product.
Specific Target Organ Toxicity (STOT) - Single Exposure
Severe corrosion to the respiratory tract at high concentrations.
Specific Target Organ Toxicity (STOT) - Repeated Exposure
Severe corrosion to the respiratory tract at high concentrations.

SECTION 12: Ecological information

12.1. Toxicity
No data available.
12.2. Persistence and degradability
No data available.
12.3. Bioaccumulative potential
No data available.
12.4. Mobility in soil
No data available.
12.5. Results of PBT and vPvB assessment
No data available.
12.6. Other adverse effects
May cause pH changes in aquatic ecological systems.

SECTION 13: Disposal considerations

13.1. Waste treatment methods
Do not discharge into any place where its accumulation could be dangerous. Gas may be scrubbed in alkaline solution under controlled conditions to avoid violent reaction. Contact supplier if guidance is required. Must not be discharged to atmosphere. Refer to the EIGA code of practice (Doc.30 “Disposal of Gases”, downloadable at http://www.eiga.org) for more guidance on suitable disposal methods.
Gases in pressure containers excluding those, which are mentioned under 16 05 04
containers ensure that they are firmly secured. Ensure that the container valve is closed and not leaking. Ensure that the valve outlet cap nut or plug (where provided) is correctly fitted. Ensure that the valve protection device (where provided) is correctly fitted. Ensure adequate ventilation. Ensure compliance with applicable regulations.

SECTION 15: Regulatory information

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

Seveso Directive 96/82/EC: Covered

Other regulations
Dangerous Substances and Explosive Atmospheres Regulations (DSEAR 2002 No. 2776)
Management of Health and Safety at Work Regulations (1999 No. 3242)
The Regulatory Reform (Fire Safety) Order 2005 (2005 No. 1541)
Control of Substances Hazardous to Health Regulations (COSHH, 2002 No. 2677)
Provision and Use of Work Equipment Regulations (PUWER, 1998 No. 2306)
Personal Protective Equipment Regulations (1992 No. 2966)
Control of Major Accident Hazards Regulations (COMAH, 1999 No. 743)
Chemical Hazards Information and Packaging for Supply (CHIP, 1994 No. 3247)
Pressure Systems Safety Regulations (PER, 2000 No. 128)

15.2. Chemical safety assessment
CSA has not been carried out.

SECTION 16: Other information

Ensure all national/local regulations are observed. Ensure operators understand the toxicity hazard. Users of breathing apparatus must be trained. Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out.

Advice
Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted. Details given in this document are believed to be correct at the time of going to press.

Further information
Note: When using this document care should be taken, as the decimal sign and its position complies with rules for the structure and drafting of international standards, and is a comma on the line. As an example 2.000 is two (to three decimal places) and not two thousand, whilst 1.000 is one thousand and not one (to three decimal places).

References

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