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MATERIAL SAFETY DATA SHEET

003

PRODUCT NAME **AMMONIA**

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Supplier Name BOC LIMITED (AUSTRALIA)
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Emergency 1800 653 572 (24/7) (Australia only)
Web Site <http://www.boc.com.au/>
Synonym(s) AMMONIA ANHYDROUS • ANHYDROUS AMMONIA • R717 • PRODUCT CODES: 160, 175, 178, 230, 300 • 003 - MSDS NUMBER
Use(s) AQUEOUS AMMONIA • CHEMICAL REAGENT • FERTILISER • HEAT TREATMENT • NITRIDING AGENT • REFRIGERANT
MSDS Date 09 November 2007

2. HAZARDS IDENTIFICATION

CLASSIFIED AS HAZARDOUS ACCORDING TO NOHSC CRITERIA

RISK PHRASES

R10 Flammable.
R23 Toxic by inhalation.
R34 Causes burns.
R50 Very toxic to aquatic organisms.

SAFETY PHRASES

S1/2 Keep locked up and out of reach of children.
S16 Keep away from sources of ignition - No smoking.
S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice
S36/37/39 Wear suitable protective clothing, gloves and eye/face protection.
S45 In case of accident or if you feel unwell seek medical advice immediately (show the label where possible).
S61 Avoid release to the environment. Refer to special instructions / safety data sheets.
S9 Keep container in a well ventilated place.

CLASSIFIED AS A DANGEROUS GOOD BY THE CRITERIA OF THE ADG CODE

UN No. 1005 **DG Class** 2.3 **Subsidiary Risk(s)** 8
Pkg Group None Allocated **Hazchem Code** 2RE **EPG** 2B3

3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	Formula	CAS No.	Content
AMMONIA	N-H3	7664-41-7	>99.5%

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4. FIRST AID MEASURES

Eye	If in eyes, hold eyelids apart and flush the eye continuously with running water. Continue flushing until advised to stop by the PIC or a doctor, or for at least 15 minutes.
Inhalation	Quickly remove from exposure. Remove contaminated clothing and check that there is no obstruction to the airway. If breathing is weak or has ceased and give artificial respiration. Further treatment should be symptomatic and supportive. Consult doctor and recommend admission to hospital for observation.
Skin	Cold burns: Remove contaminated clothing and gently flush affected areas with warm water (30 C) for 15 minutes. Apply sterile dressing and treat as for a thermal burn. For large burns, immerse in warm water for 15 minutes. DO NOT apply any form of direct heat. Seek immediate medical attention.
Ingestion	This is an unlikely route of exposure since ammonia is a gas at room temperature and pressure, but may cause chemical burns to the mouth, oesophagus and stomach when ingested as aqueous ammonia (ammonium hydroxide).
Advice to Doctor	Management of pulmonary oedema. Alkali burns, particularly to the eyes, can result in severe and sometimes permanent damage.
First Aid Facilities	Eye wash facilities and safety shower are recommended.

5. FIRE FIGHTING MEASURES

Flammability	Non flammable liquid - gas is flammable within certain vapour concentration limits and can form explosive mixtures with air. Gas is lighter than air and will generally disperse, however may concentrate in hollows or sumps. Dissolves exothermically in water. Corrosive to metals evolving flammable hydrogen. Eliminate all ignition sources including cigarettes, open flames, spark producing switches/tools, heaters, naked lights, pilot lights, mobile phones etc. when handling.
Fire and Explosion	Potentially flammable gas. Temperatures in a fire may cause cylinders to rupture and internal pressure relief devices to be activated. Call fire brigade. This product will add fuel to a fire. Cool cylinders exposed to fire by applying water from a protected location. Do not approach cylinders suspected of being hot. Remove cool cylinders from the path of the fire. Evacuate the area if unable to keep cylinders cool. If a flame from the cylinder is impinging on flammable materials or other cylinders then evacuate the area. If the cylinder is standing alone and the flame is not impinging on flammable materials or other cylinders then let the flame continue until all gas has been consumed. Ensure working area is well ventilated before re-entry. Include oxides of nitrogen which are hazardous gases.
Extinguishing	For small flames, use dry chemical, carbon dioxide or water spray. For large fires, use water fog or spray. Note that ammonia is readily absorbed by water and the resultant ammonia solution is alkaline. Prevent contamination of drains or waterways, absorb runoff with sand or similar.
Hazchem Code	2RE

6. ACCIDENTAL RELEASE MEASURES

Spillage	GAS CYLINDERS: If the cylinder is leaking, eliminate all potential ignition sources and evacuate area of personnel. Inform manufacturer/supplier of leak. Wear appropriate PPE and carefully move it to a well ventilated remote area, then allow to discharge. Do not attempt to repair leaking valve or cylinder safety devices. Leaks - Due to its powerful and distinctive odour, any leakage of ammonia will be rapidly noticed and the general area of the source of leakage determined. Precise pin-pointing of the leak can be achieved by the application of wet litmus or phenolphthalein-impregnated paper to suspected areas; the alkalinity of the gas turns litmus blue and phenolphthalein red. A burning sulphur tape or sulphur dioxide gas can also be used for leak detection; the chemical reaction in this case producing dense white fumes in the presence of ammonia.
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7. STORAGE AND HANDLING

Storage	Do not store near sources of ignition or incompatible materials. Cylinders should be stored below 45 C in a secure area, upright and restrained to prevent cylinders from falling. Cylinders should also be stored in a dry, well ventilated area constructed of non-combustible material with firm level floor (preferably concrete), away from areas of heavy traffic and emergency exits. Outside or detached storage preferred. Keep out of direct sunlight. Refer to AS/NZ 2022: Anhydrous Ammonia - Storage and Handling and AS 4332: The Storage and Handling of Gases in Cylinders.
Handling	Before use carefully read the product label. Use of safe work practices are recommended to avoid eye or skin contact and inhalation. Observe good personal hygiene, including washing hands before eating. Prohibit eating, drinking and smoking in contaminated areas. Use only in well-ventilated areas. When handling cylinders, use appropriate trolley. Do not drag or roll cylinders.

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8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Stds	Ingredient	Reference	TWA		STEL	
			ppm	mg/m3	ppm	mg/m3
	Ammonia	NOHSC (AUS)	25.0	17.0	35.0	24.0

Biological Limits No biological limit allocated.

Engineering Controls Use only in well ventilated areas. Maintain vapour levels below the recommended exposure standard.

PPE When handling cylinders wear safety boots, safety glasses and abrasion-resistant gloves. Where a low-level inhalation risk exists, wear coveralls, full-face canister-type respirator (Type K), gloves and head cover. For significant inhalation risks (ie. >300ppm) wear skin protective clothing, safety boots and self-contained breathing apparatus (SCBA) or air-line respirator. Impermeable skin protection is required if liquid splashes may occur. Respirators and breathing apparatus shall comply with AS/NZS 1716 while protective clothing shall comply with AS 2022. Only trained and experienced persons should use this product.



9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	COLOURLESS GAS OR LIQUID	Solubility (water)	0.576 kg/kg
Odour	PUNGENT SUFFOCATING ODOUR	Specific Gravity	NOT APPLICABLE
pH	NOT APPLICABLE	% Volatiles	100 %
Vapour Pressure	960 kPa @ 25°C	Flammability	FLAMMABLE
Vapour Density	0.597 (Air = 1)	Flash Point	23°C to 60.5°C
Boiling Point	-33.4°C	Upper Explosion Limit	28 %
Melting Point	-78°C	Lower Explosion Limit	15 %
Evaporation Rate	100 %	Autoignition Temperature	651°C
Critical Pressure	11,277 kPa	Critical Temperature	132.4°C (Liquefiable gas)
Liquid density	602 kg/m3 @ 25°C		

10. STABILITY AND REACTIVITY

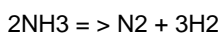
Chemical Stability Stable under recommended conditions of storage.

Conditions to Avoid Avoid shock, friction, heavy impact, heat, sparks, open flames and other ignition sources.

Material to Avoid Incompatible (explosively in some instances) with oxidising agents (ie. peroxides), acids, (eg. sulphuric acid), active metals (eg. aluminium, potassium, magnesium) and heat sources. Ammonia is stable. Ammonia has potentially explosive or violent reactions with strong oxidisers, nitric acid, fluorine and nitrogen oxide. Ammonia forms explosive products with silver chloride, silver oxide, bromine, iodine and mercury. Ammonia is incompatible or has potentially hazardous reactions with silver, acetaldehyde, acrolein, boron, perchlorates, chlorine monoxide, chlorites, nitrogen tetroxide and sulphur. Ammonia is hygroscopic and will absorb moisture from the air to form an alkaline aqueous solution. Commercial anhydrous ammonia contains some moisture and readily attacks copper, cadmium, zinc (galvanised), tin and their alloys such as brass and bronze. These materials must not be used in ammonia systems).

Iron and steel, aluminium, and their alloys (when free from copper) are normally resistant to corrosion by ammonia. Piping should be rigid steel except where connections are required such as between cylinders. For industrial ammonia applications steel-reinforced flexible neoprene line is recommended for pig-tails. When handling higher purities either stainless steel or PTFE (Teflon) is used. Other suitable materials of construction include glass, ceramic, Peek, tantalum and titanium.

Decomposition When heated at atmospheric pressure above 450°C, ammonia breaks down to nitrogen and hydrogen (flammable gas).



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Hazardous Reactions Polymerization is not expected to occur.

11. TOXICOLOGICAL INFORMATION

Health Hazard Summary	Highly corrosive. Characteristic smell from 5 ppm and irritant effects usually provides good warning properties. Extremely irritating and corrosive. Exposure to low levels may cause irritation with coughing and broncho spasm. Acute exposure to high levels may result in pulmonary oedema and asphyxia. Can be promptly fatal above 1500 ppm. Delayed reaction including pulmonary oedema up to 24 hours after exposure. Chronic irritation to the eyes, nose and upper respiratory tract may result from repeated exposure to ammonia vapour.
Eye	Ammonia vapour is irritating to eyes and may cause pain, tears and acute corneal damage at high concentrations. Ammonia liquid is corrosive to eyes and splashes or spray may cause freeze burns, leading to severe redness, swelling of the mucus membranes that cover the eye and inside of the eyelids, damage to the iris and cornea and permanent damage and blindness.
Inhalation	Inhalation of concentrations moderately above the exposure standard (25ppm) may cause irritation to the nose and throat. Higher concentrations may cause breathing difficulty, chest pain, coughing, pink frothy sputum and pulmonary oedema. Accumulation of fluid in the lungs can occur. Upper airway swelling may occur and lead to airway obstruction. Overexposure may predispose to the development of acute bronchitis and pneumonia.
Skin	Highly corrosive. Severe skin irritation. Evaporating liquid may cause low temperatures of piping and equipment which could lead to cold burns.
Ingestion	Due to product form, ingestion is considered unlikely.
Toxicity Data	AMMONIA (7664-41-7) LC50 (Inhalation): 2000 ppm/4 hours (rat) LD50 (Ingestion): 350 mg/kg (rat)

12. ECOLOGICAL INFORMATION

Environment	When ammonia appears in water under the normal conditions (aerobic), it is rapidly converted to nitrate by nitrification; the principal water contaminant normally being nitrate. The pH in water is increased by the presence of ammonia ion, in the form of hydroxide ions. Ammonia is strongly adsorbed on soil, and on sediment particles and colloids in water. Harmful to the environment. When ammonia appears in water under the normal conditions (aerobic), it is rapidly converted to nitrate by nitrification; the principal water contaminant normally being nitrate. When ammonia is dissolved in water the pH increases. Very toxic to plants and aquatic organisms.
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13. DISPOSAL CONSIDERATIONS

Waste Disposal	Cylinders should be returned to the manufacturer or supplier for disposal of contents.
Legislation	Dispose of in accordance with relevant local legislation.

14. TRANSPORT INFORMATION

Transport	Ensure cylinder is separated from driver. Refer to the ADG Code for regulations on transport of dangerous goods and HB 76.
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Shipping Name	AMMONIA, ANHYDROUS				
UN No.	1005	DG Class	2.3	Subsidiary Risk(s)	8
Pkg Group	None Allocated	Hazchem Code	2RE	EPG	2B3
IATA					
Shipping Name	AMMONIA, ANHYDROUS				
UN No.	1005	DG Class	2.3	Subsidiary Risk(s)	8
Pkg Group	None Allocated				
IMDG					
Shipping Name	AMMONIA, ANHYDROUS				
UN No.	1005	DG Class	2.3	Subsidiary Risk(s)	8
Pkg Group	None Allocated				

15. REGULATORY INFORMATION

Poison Schedule Classified as a Schedule 6 (S6) Poison using the criteria in the Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

AICS All chemicals listed on the Australian Inventory of Chemical Substances (AICS).

16. OTHER INFORMATION

Additional Information Application method: Gas withdrawal: regulator of suitable pressure and flow rating fitted to cylinder or manifold with low pressure gas distribution to equipment. Liquid withdrawal: appropriate refrigeration equipment or appropriate heat exchanger to vaporise the liquid.

ABBREVIATIONS:

ADB - Air-Dry Basis.

BEI - Biological Exposure Indice(s)

CAS# - Chemical Abstract Service number - used to uniquely identify chemical compounds.

CNS - Central Nervous System.

IARC - International Agency for Research on Cancer.

M - moles per litre, a unit of concentration.

mg/m³ - Milligrams per cubic metre.

NOS - Not Otherwise Specified.

pH - relates to hydrogen ion concentration using a scale of 0 (high acidic) to 14 (highly alkaline).

ppm - Parts Per Million.

TWA/ES - Time Weighted Average or Exposure Standard.

HEALTH EFFECTS FROM EXPOSURE:

It should be noted that the effects from exposure to this product will depend on several factors including: frequency and duration of use; quantity used; effectiveness of control measures; protective equipment used and method of application. Given that it is impractical to prepare a Chem Alert report which would encompass all possible scenarios, it is anticipated that users will assess the risks and apply control methods where appropriate.

PERSONAL PROTECTIVE EQUIPMENT GUIDELINES:

The recommendation for protective equipment contained within this Chem Alert report is provided as a guide only. Factors such as method of application, working environment, quantity used, product concentration and the availability of engineering controls should be considered before final selection of personal protective equipment is made.

Report Status This document has been compiled by RMT on behalf of the manufacturer of the product and serves as the manufacturer's Material Safety Data Sheet ('MSDS').

It is based on information concerning the product which has been provided to RMT by the manufacturer or obtained from third party sources and is believed to represent the current state of knowledge as to the appropriate safety and handling precautions for the product at the time of issue. Further clarification regarding any aspect of the product should be obtained directly from the manufacturer.

While RMT has taken all due care to include accurate and up-to-date information in this MSDS, it does not provide any warranty as to accuracy or completeness. As far as lawfully possible, RMT accepts no liability for any loss, injury or damage (including consequential loss) which may be suffered or incurred by any person as a consequence of their reliance on the information contained in this MSDS.

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End of Report