PUREGAS	SAFETY DATA SHEET	Revised edition no : 2 Date : 12/05/2014
	Hydrogen Gas *(All grades)*	PG 017

SECTION 1. IDENTIFICATION OF THE PRODUCT AND COMPANY UNDERTAKING

Trade Name	Hydrogen Gas (All Grades)
Chemical Family	N/A
Chemical Name	Hydrogen Gas
Synonyms	Hydrogen, Hydrogen, compressed, Molecular hydrogen
Chemical Abstract no	1333-74-0
NIOSH No	N/A
UN no	1049
Company:	**Puregas (Pty) Ltd** PO Box 123884, Alrode, 1451, South Africa **Tel :** (011) 903 9760 **Fax:** (011) 903 9766 **Cellphone:** 082 889 6946 (1st) 082 885 7475 (2nd) Info@puregas.co.za **Emergency Tel**: 0800 172 743 (Rapid Spill Response)

SECTION 2. HAZARDS IDENTIFICATION

Main Hazard	The main health hazard associated with releases of this gas is asphyxiation, by displacement of oxygen. The cryogenic liquid will rapidly boil to the gas at standard temperatures and pressures. The liquefied gas can cause frostbite to any contaminated tissue.
Flammability	Flammable Gas (burns at all ambient temperatures)
Chemical hazard	An extreme explosion hazard exists in areas in which the gas has been released but the material has not yet ignited. Hydrogen burns with an almost invisible blue flame
Biological hazard	Currently, biological exposure indices (BEIS) are not applicable for this product
Reproduction hazard	This product is not expected to cause adverse reproductive effects in humans.
Eye effects	Contact with rapidly expanding gases can be irritating to exposed eyes
Health effects – skin	Contact with cryogenic liquid or rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin colour to white or grayish-yellow. The pain after contact with liquid can quickly subside
Health effects – ingestion	Not applicable to gases
Health effects – inhalation	High concentrations of this gas can cause an oxygen-deficient environment. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting and depression of all the senses. Under some circumstances of over-exposure, death may occur. The following effects associate with various levels of oxygen are as follows: 12-16% oxygen – breathing and pulse rate increased, muscular co-ordination

	slightly disturbed 10-14% - emotional upset, abnormal fatigue, disturbed respiration 6-10% - nausea and vomiting, collapse or loss of consciousness Below 6% - convulsive movements, possible respiratory collapse, and death
Carcinogenicity	No known effect
Mutagenecity	No known effect
Neurotoxity	No known effect

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous components	May contain small amounts of helium and hydrocarbon gas such as methane
EEC Classification	N/A
R Phrases	N/A

SECTION 4. FIRST AID MEASURES

Eye contact	Not applicable
Skin contact	In case of frostbite, place the frostbitten part in warm water. Do no use hot water. If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area in the armpit. Encourage victim to gently exercise the affected part while being warmed. Seek medical attention.
Ingestion	Not applicable
Inhalation	Rescuers should not attempt to retrieve victims of exposure to this product without adequate personal protective equipment. At a minimum, self-contained breathing apparatus and fire retardant personal protective equipment should be worn. Adequate fire protection must be provided during rescue situations. Remove victim(s) to fresh air, as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Only trained personnel should administer supplemental oxygen.

SECTION 5. FIRE-FIGHTING MEASURES

Extinguishing Media	Dry chemical, carbon dioxide, water spray, foam, fog
Special Hazards	Container may explode in fire.
Protective Clothing	Wear suitable protective clothing
Firefighting instructions	Do not extinguish a leaking gas flame unless leak can be securely plugged. Stop flow of gas and move containers from fire area if without risk. Use water to keep fire-exposed containers cool. Container may explode in fire.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal Precautions	Restrict access to area until completion of clean-up. Ensure clean-up is conducted by trained personnel only. Wear adequate personal protective equipment. Extinguish or remove all ignition sources. Ventilate area
Environmental Precautions	No data available
Small spills / Large spills	Stop leak if it can be done without risk. Use water spray to reduce vapour. Isolate area until gas has dispersed

SECTION 7. HANDLING AND STORAGE

Suitable material	N/A
Handling/storage precautions	Do not use near welding operations, flames or hot surfaces. Move cylinders by hand-truck or cart designed for that purpose. Do not lift cylinders by their caps. Do not handle them with oily hands. Secure cylinder in place in an upright position at all times. Do not drop cylinders or permit them to bang against each other. Leave valve cap on cylinder until cylinder is secured and ready for use. Close all valves when not in actual use. Use smallest possible amounts in designated areas with adequate ventilation. Have emergency equipment (for fires, spills, leaks, etc.) readily available Comply with all applicable regulations for the storage and handling of compressed gases and flammable materials. Store at or above ground level, in a cool, dry, well-ventilated area, out of direct sunlight and away from heat and ignition sources. Cylinder temperature should never exceed 51ºC. Label empty cylinders. Store full cylinders separately from empty ones. Empty containers may be hazardous due to residual material. Limit quantity of material in storage. Restrict access to storage area. Post appropriate warning signs. Keep storage area separate from populated work areas. Consider leak detection and alarm equipment for storage area

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure limits.	No data available
Engineering control measures	Engineering control methods to reduce hazardous exposures are preferred. Methods include mechanical ventilation (dilution and local exhaust), process or personnel enclosure, control of process conditions and process modification (e.g. substitution of a less hazardous material). Administrative controls and personal protective equipment may also be required. Provide adequate local exhaust and dilution (general) ventilation to control airborne hydrogen below 4000 ppm (10% of the lower explosive limit). Exhaust directly to the outside. Supply sufficient replacement air to make up for air removed by exhaust systems.
Personal protection – respiratory	Maintain oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection if oxygen levels are below 19.5% or during emergency response to a release of this product.
Personal protection – hand.	Wear mechanically-resistant gloves when handling cylinders of this product. Use low-temperature protective gloves (i.e. kevlar) when working with containers of liquid hydrogen.

Personal protection – eye	Splash goggles or safety glasses, for protection from rapidly expanding gases and splashes of liquid hydrogen
Personal protection – skin	Use body protection appropriate for task. Transfer of large quantities under pressure may require protective equipment appropriate to protect employees from splashes of liquefied product, as well as fire retardant items
Other protection	None required

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Colourless gas
Odor:	Odourless
pH:	N/A
Boiling point:	-252.8ºC
Melting point:	-259.2ºC
Flash point:	Flammable gas (burns at all ambient temperatures)
Flammability:	Lower 4.0% Upper 75%
Auto flammability:	571.2ºC

Explosive properties:	None
Oxidizing properties:	None
Vapour pressure :	N/A
Density:	0.0695 (air = 1)
Solubility - water:	Slightly soluble (1.8% v/v at 20ºC)
Solubility - solvent:	Slightly soluble in ethanol, ether
Solubility - coefficient:	N/A

SECTION 10. STABILITY AND REACTIVITY

Conditions to Avoid	Contact with incompatible materials and exposure to heat, sparks and other sources of ignition. Cylinders exposed to high temperatures or direct flame can rupture o burst
Incompatible materials	Strong oxidizers (i.e. chlorine, bromine, pentafluoride, oxygen, oxygen difluoride, and nitrogen trifluoride). Oxygen/hydrogen mixtures can explode on contact with a catalyst such as platinum
Hazardous decomposition products	Hydrogen. When ignited in the presence of oxygen, water will be produced

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity	There is no specific toxicological data for hydrogen. Hydrogen is a simple asphyxiant, which acts to displace oxygen in the environment
Chronic toxicity	Irritancy of product : Contact with rapidly expanding gases can be irritating to exposed skin and eyes
Carcinogenicity	No data available
Mutagenicity	Not suspected to be a cancer-causing agent
Reproductive hazards	This product is not expected to cause mutagenic effects in humans This product is not expected to cause adverse reproductive effects in humans

SECTION 12. ECOLOGICAL INFORMATION

Hydrogen occurs naturally in the atmosphere. The gas will be dissipated rapidly in well-ventilated areas

Any adverse effect on animals would be related to oxygen deficient environments. No adverse effect is anticipated to occur to plant-life, except for frost produced in the presence of rapidly expanding gases

No evidence is currently available on this product's effects on aquatic life

Aquatic toxicity – fish	As above
Aquatic toxicity – daphnia	As above
Aquatic toxicity – algae	As above
Biodegradability	As above
Bio-accumulation	As above
Mobility	As above
German wgk	N/A

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods	Waste disposal must be in accordance with appropriate local regulations. Return cylinders with any residual product to supplier. Do not dispose of locally
Disposal packaging	N/A

SECTION 14. TRANSPORT INFORMATION

UN no: 1049/1966	**IMDG - EMS No:** N/A
ADR/RID Substance identity no: 1049/1966	**IMDG – MFAG table on :** N/A
ADR/RID class: 2.1 Flammable gas	**IATA - class :** 2.1 Flammable gas
ADR/RID item no: N/A	**IATA – subsidiary risk(s):** N/A
ADR/RID hazard identity no: N/A	**UK – description:** No data available
IMDG - shipping name: (1049) Hydrogen, compressed or Hydrogen (1966) Hydrogen, refrigerated liquid	**UK emergency action class:** No data available **UK classification :** No data available
IMDG - class: 2.1 Flammable gas	**Tremcard No:** N/A
IMDG – packaging group: N/A	
IMDG - marine pollutant: Not classified as a marine pollutant	

SECTION 15. REGULATORY INFORMATION

EEC hazard classification : F+ - Extremely flammable

Risk phrases : Extremely flammable (R12)

Safety phrases: Keep out of reach of children. Keep container in a well-ventilated place, Keep away from sources of ignition – No smoking. Take precautionary measures against static discharges (S2- 9-16-33)

National Legislation : ***OSH Act, National Road Traffic Act (when promulgated)***

SECTION 16. OTHER INFORMATION

SELECTED BIBLIOGRAPHY

1. *Data sheets as supplied by various Suppliers and Manufacturers*
2. *Emergency Response Handbook - Annex A of SABS 0232-3*
3. *Handling Chemicals Safety, 2nd. Ed. Dutch Association of Safety Experts, Dutch Chemical Industry Association, Dutch Safety Institute, 1980*
4. *NIOSH Pocket Guide to Chemical Hazards, NIOSH, June 1990*
5. *Micromedex, Inc. TOMES CPS ™ System Vol. 39*
6. *Patty's Industrial Hygiene Toxicology, 4th ed. Vol. II Part A, George D Clayton, Florence E Clayton*
7. *Supplement to NIOSH Manual of Analytical Methods, 3rd ed., NIOSH Publication No 84-100, 1985*
8. *Toxic & Hazardous Industrial Safety Manual - Industrial Chemicals Safety Manual for Handling and disposal with toxicity and hazard data*
9. *WinSpirs 2.1 as supplied by the Canadian Centre for Occupational Health and Safety.*