Product Name: Gas Mixture (5 – 20% Hydrogen + Balance Argon)

DOT ID No: UN 1954
DOT Hazard Class: 2.1
Emergency No: +971-6-5336481
MSDS No: GM-015

DOT Shipping Label: Compressed Gas, Flammable

Date last updated: 03/10/2009
Revision No: 00

1. Product Name: - Hydrogen (5-20%) in Argon

2. Chemical Name: - Gas Mixture

3. Hazards Identification

NOT CLASSIFIED AS HAZARDOUS ACCORDING TO NOHSC CRITERIA

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

4. Composition Information

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Concentration</th>
<th>CAS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen (H₂)</td>
<td>5 - 20%</td>
<td>1333-74-0</td>
</tr>
<tr>
<td>Argon (Ar)</td>
<td>80 - 95%</td>
<td>7440-37-1</td>
</tr>
</tbody>
</table>

5. FIRST AID MEASURES

5.1 Eye: Not applicable.

5.2 Inhalation: Remove from area of exposure immediately. If assisting a victim avoid becoming a casualty, wear an Air-line respirator or Self Contained Breathing Apparatus (SCBA). If victim is not breathing apply artificial respiration and seek urgent medical attention. Give oxygen if available. Keep warm and rested.

5.3 Skin: Not applicable.

5.4 Ingestion: Due to product form (Gaseous) and application, ingestion is considered unlikely.

5.5 Advice to Doctor: Treat symptomatically.
6. FIRE FIGHTING MEASURES

6.1 Flammability: Highly flammable. Eliminate all ignition sources including cigarettes, open flames, spark producing switches/tools, heaters, naked lights, pilot lights, mobile phones etc. when handling.

6.2 Fire and Explosion: Highly 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.

6.3 Extinguishing: Stop flow of gas if safe to do so. Allow cylinders to burn if already ignited. Cool cylinders with water spray from protected area. Contact manufacturer for further advice.

6.4 Hazchem Code: 2SE

7. ACCIDENTAL RELEASE MEASURES

7.1 Spillage GAS CYLINDERS: If the cylinder is leaking, wear appropriate PPE and move it to a well ventilated area, and then allow discharging. Eliminate all potential ignition sources. Inform manufacturer/supplier of leak. Do not attempt to repair leaking valve. Clear area of personnel. Minimise leak as far as possible by orientating leak point in gas, not liquid phase.

8. HANDLING AND STORAGE

8.1 Handling Use safe work practices to avoid eye or skin contact and inhalation. Observe good personal hygiene. Prohibit eating, drinking and smoking in contaminated areas. Wash hands before eating. Remove contaminated clothing and protective equipment before entering eating areas.

8.2 Storage Do not store near sources of ignition or incompatible materials. Cylinders should be stored below 45°C in a secure area and upright to prevented 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.

9. EXPOSURE CONTROLS / PERSONNAL PROTECTION

9.1 Ventilation Maintain adequate ventilation. Confined areas (e.g. tanks) should be adequately ventilated or gas tested. Flammable/explosive vapours may accumulate in poorly ventilated areas. Vapours may also travel some distance to an ignition source and flash back.
9.2 PPE Wear safety glasses, safety boots and leather gloves. When using large quantities or where heavy contamination is likely, wear coveralls. Where an inhalation risk exists, wear Self Contained Breathing Apparatus (SCBA) or an Air-line respirator. Clothing should be cotton or wool rather than synthetic materials which can melt at flame temperatures.

10. PHYSICAL AND CHEMICAL PROPERTIES:

- **Appearance**: COLOURLESS GAS
- **Odour**: ODOURLESS
- **PH**: NOT AVAILABLE
- **Vapour Pressure**: NOT AVAILABLE
- **Vapour Density**: NOT AVAILABLE
- **Boiling Point**: NOT AVAILABLE
- **Melting Point**: NOT AVAILABLE
- **Evaporation Rate**: NOT AVAILABLE
- **Solubility (water)**: NOT AVAILABLE
- **Specific Gravity**: NOT AVAILABLE
- **% Volatiles**: NOT AVAILABLE
- **Flammability**: HIGHLY FLAMMABLE
- **Flash Point**: NOT AVAILABLE
- **Upper Explosion Limit**: 75 % (Hydrogen)
- **Lower Explosion Limit**: 4 % (Hydrogen)
- **Autoignition Temperature**: NOT AVAILABLE
- **Density**: 1.3 (Air = 1)
Reactivity: Hydrogen is explosive with peroxides, oxidizing agents, metal catalysts and liquid nitrogen. Can cause embrittlement of steels under special conditions & preference given to copper, bronze or stainless steel.

Decomposition Products: May evolve toxic gases if heated to decomposition.

12. TOXOLOGICAL INFORMATION

12.1 Health Hazard Summary
Asphyxiant gas - non irritant. Symptoms of exposure are directly related to displacement of oxygen from air. As the amount of oxygen inhaled is reduced from 21-14% volume, the pulse rate will accelerate and the rate and volume of breathing will increase. The ability to maintain attention and think clearly is diminished, muscular co-ordination is somewhat disturbed. As oxygen decreases from 14-10% volume, judgement becomes faulty, severe injuries may cause no pain. Muscular effort leads to rapid fatigue. Further reduction to 6% may cause nausea and vomiting. Ability to move may be lost. Permanent brain damage may result even after resuscitation from exposure to this low level of oxygen. Below 6% breathing is in gasps and convulsions may occur. Inhalation of a mixture containing no oxygen may result in unconsciousness from the first breath and death will follow in minutes.

12.2 Eye : Non irritating.

12.3 Inhalation
: Non irritating - Asphyxiant. Effects are proportional to oxygen displacement.

12.4 Skin : Non irritating.

12.5 Ingestion : Due to product form (gas), ingestion is considered highly unlikely.

13. ECOLOGICAL INFORMATION

13.1 Environment: Hydrogen occurs chiefly in combination with oxygen in water, but is also present in organic matter such as living plants, petroleum, coal etc. If is present as a free element in the atmosphere but only at concentrations of less than 1 ppm.

ATMOSPHERE: Argon is an inert gas and will not contribute to ozone depletion or global warming. Argon is a natural component of the atmosphere (0.93% v/v).

SOIL/WATER: If released to soil or water argon will quickly evaporate to the atmosphere. Not toxic to plants or animals except at extremely high (asphyxiating) levels.
14. DISPOSAL CONSIDERATION

14.1 Waste Disposal: Cylinders should be returned to the manufacturer or supplier for disposal.

14.2 Legislation: Dispose of in accordance with relevant local legislation.

15. TRANSPORTATION INFORMATION

Transport: Ensure cylinder is separated from driver and that outlet of relief device is not obstructed.

UN Number : 1954
Shipping Name : COMPRESSED GAS, FLAMMABLE, N.O.S.
DG Class : 2.1
Subsidiary Risk(s) : None Allocated
Packing Group : None Allocated
Hazchem Code : 2SE

Poison Schedule: A poison schedule number has not been allocated to this product using the criteria in the Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

16. OTHER INFORMATION

16.1 Additional Information: Gas regulator of suitable pressure and flow rating fitted to cylinder or manifold with low pressure gas distribution to equipment.

16.2 ABBREVIATIONS:

mg/m3 - Milligrams per cubic meter
ppm - Parts Per Million
TWA/ES - Time Weighted Average or Exposure Standard.
MATERIALS SAFETY DATA SHEET

Product Name: Gas Mixture
(5-20% Hydrogen + Balance Argon)

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pH   - Relates to hydrogen ion concentration - this value will relate to a scale of 0 - 14,

where 0 is highly acidic and 14 is highly alkaline.

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

M   - Moles per liter, a unit of concentration.

IARC   - International Agency for Research on Cancer.

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