

SAFETY DATA SHEET

SDS ID NO.: 0111MAR022
Revision Date: 10/08/2019

1. IDENTIFICATION

Product Name: MarkWest Hydrogen

Synonym: Hydrogen; Protium
Product Code: 0111MAR022
Chemical Family: Gas

Recommended Use: Feedstock.
Restrictions on Use: All others.

Manufacturer, Importer, or Responsible Party Name and Address:
MarkWest Energy Partners, L.P.
a subsidiary of MPLX LP
1515 Arapahoe Street
Tower 1, Suite 1600
Denver, Colorado 80202

SDS information: 1-419-421-3070 (M-F, 8-5 EST)

Emergency Telephone: CHEMTREC: 1-800-424-9300

2. HAZARD IDENTIFICATION

Classification

OSHA Regulatory Status

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable gases	Category 1
Gases under pressure	Compressed Gas
Simple asphyxiant	-

Hazards Not Otherwise Classified (HNOC)

Contact with product may cause frostbite.

Label elements

EMERGENCY OVERVIEW

Danger

Extremely flammable gas
Contains gas under pressure; may explode if heated
May displace oxygen and cause rapid suffocation
Contact with rapidly expanding gas may cause frostbite



Appearance Colorless Compressed Gas	Physical State Gas	Odor Odorless
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Precautionary Statements - Prevention

Keep away from heat/sparks/open flames/hot surfaces. - No smoking

Precautionary Statements - Response

Leaking gas fire: Do not extinguish, unless leak can be stopped safely
Eliminate all ignition sources if safe to do so

Precautionary Statements - Storage

Store in a well-ventilated place
Protect from sunlight

Precautionary Statements - Disposal

Dispose of contents/container at an approved waste disposal plant

3. COMPOSITION/INFORMATION ON INGREDIENTS

Composition Information:

Name	CAS Number	% Concentration
Hydrogen	1333-74-0	99-100

All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

4. FIRST AID MEASURES

First Aid Measures

- General Advice:** In case of accident or if you feel unwell, seek medical advice immediately (show directions for use or safety data sheet if possible).
- Inhalation:** Remove to fresh air. If not breathing, utilize bag valve mask or other form of barrier device to institute rescue breathing. If breathing is difficult, ensure airway is clear, give oxygen and continue to monitor. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). Get immediate medical attention.
- Skin Contact:** If product has caused frostbite, remove contaminated clothing. Thaw frost bitten areas slowly with lukewarm water or by wrapping affected areas with blankets. Do not rub affected areas. Let circulation reestablish itself naturally, exercising area if possible. Get medical attention.
- Eye Contact:** Flush with large amounts of tepid water for at least 15 minutes. Gently remove contact lenses while flushing. Eyelids should be held away from the eyeball to ensure thorough rinsing. If frostbite is suspected (cloudy lens or greyish white tissue around the eye) get immediate medical attention.
- Ingestion:** Ingestion not likely. If swallowed, immediately call a poison control center or physician.

Most important signs and symptoms, both short-term and delayed with overexposure

- Adverse Effects:** Asphyxiant gas. High concentrations in the immediate area can displace oxygen causing the feeling of suffocation and can cause headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue from oxygen deprivation. Contact with product may cause frostbite.

Indication of any immediate medical attention and special treatment needed

- Notes To Physician:** Treat symptomatically. Administer supplemental oxygen as needed.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

For small fires, Class B fire extinguishing media such as CO₂ or dry chemical can be used. For large fires use water spray or fog. Firefighting should be attempted only by those who are adequately trained and equipped with proper protective equipment.

Unsuitable extinguishing media

DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.

Specific hazards arising from the chemical

This product has been determined to be an extremely flammable gas per the OSHA Hazard Communication Standard and should be handled accordingly. Hydrogen burns with an invisible to pale blue flame that can be difficult to see. Sealed containers may rupture when heated. Gas may accumulate along the ground, settle in low lying areas or be moved by ventilation and ignited by many sources such as pilot lights, sparks, electric motors, static discharge, or other ignition sources at locations distant from material handling. Flashback can occur along vapor trail. For additional fire related information see NFPA 30 or the Emergency Response Guidebook 115.

Hazardous combustion products

Smoke, carbon monoxide, and other products of incomplete combustion.

Explosion data

Sensitivity to Mechanical Impact No.

Sensitivity to Static Discharge Yes.

Special protective equipment and precautions for firefighters

Firefighters should wear full protective clothing and positive-pressure self-contained breathing apparatus (SCBA) with a full face-piece, as appropriate. Since this gas could burn with a near invisible flame in daylight, approach with caution. Isolate hazard area. If safe to do so, stop the flow of gas and allow fire to burn out. Extinguishing the flame before shutting off the supply can cause the formation of explosive mixtures. In some cases it may be preferred to allow the flame to continue to burn. Keep surrounding area cool with water spray from a distance and prevent further ignition of combustible material.

Additional firefighting tactics

FIRES INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after the fire is out. Do not direct water at source of leak or safety devices; icing may occur. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles: if this is impossible, withdraw from area and let fire burn.

EVACUATION: Consider initial downwind evacuation for at least 1000 feet. If tank, rail car or tank truck is involved in a fire, ISOLATE for 5280 feet (1 mile) in all directions; also, consider initial evacuation of 5280 feet (1 mile) in all directions.

NFPA

Health 1

Flammability 4

Instability 0

Special Hazard -

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:

Keep people away from and upwind of spill/leak. Isolate and evacuate area. Shut off source if safe to do so. Eliminate all ignition sources. Use spark-proof tools and explosion-proof equipment. Hydrogen can auto ignite during high pressure releases. Distant ignition and flashback are possible. Monitor area for flammable or explosive atmosphere. Before entry, especially into confined areas, check atmosphere with an appropriate monitor.

Protective equipment:

Use personal protection measures as recommended in Section 8.

Emergency procedures:

Leaking containers should be moved outdoors or to well-ventilated area and contents transferred to a suitable container. Vapors may accumulate in confined spaces without sufficient ventilation. Notify local health and pollution control agencies, if appropriate.

Environmental precautions:

If leaking, take appropriate steps to disperse gas.

Methods and materials for

Prevent further leakage or spillage if safe to do so.

containment:

Methods and materials for cleaning up: Shut off gas supply, if safe to do so. Allow equipment to depressurize. Isolate area until gas has dispersed.

7. HANDLING AND STORAGE

Safe Handling Precautions: Avoid breathing fumes, gas, or vapors. Use only outdoors or with adequate ventilation. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. Gas may accumulate along the ground, settle in low lying areas or be moved by ventilation and ignited by many sources such as pilot lights, sparks, electric motors, static discharge, or other ignition sources at locations distant from material handling. Flashback may occur along vapor trails. Use only non-sparking tools. Use appropriate grounding and bonding practices. Use personal protection recommended in Section 8. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. Do not cut, drill, grind or weld on empty containers since explosive residues may remain. Comply with all applicable EPA, OSHA, NFPA and consistent state and local requirements.

Storage Conditions: Store in properly closed containers that are appropriately labeled and in a cool, well-ventilated area. Keep product and empty container away from heat and sources of ignition. Do not puncture or incinerate container.

Incompatible Materials Strong oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Name	ACGIH TLV	OSHA PELs:	NIOSH IDLH
Hydrogen 1333-74-0	Simple asphyxiant	-	-

Notes: No further information available.

Engineering measures: Local or general exhaust required in an enclosed area or when there is inadequate ventilation. Use mechanical ventilation equipment that is explosion-proof. Monitor atmospheric oxygen levels.

Personal protective equipment

Eye protection: Goggles or faceshield may be needed when handling pressurized gases.

Skin and body protection: Wear appropriate protective gloves to prevent skin contact. Contact the glove manufacturer for specific advice on glove selection and breakthrough times.

Respiratory protection: Use atmosphere supplying respirators in the event of oxygen deficiency, when material produces gases and/or vapors that exceed permissible limits, or when excessive gases and/or vapors are generated. Observe respirator assigned protection factors (APFs) criteria cited in federal OSHA 29 CFR 1910.134. Self-contained breathing apparatus should be used for fire fighting.

Note: Air purifying respirators are not to be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturers instructions), in oxygen deficient atmospheres, (less than 19.5% oxygen) or under conditions that are immediately dangerous to life and health (IDLH).

Hygiene measures: Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Do not smoke while handling.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical State Gas

Appearance	Colorless Compressed Gas
Color	Colorless
Odor	Odorless
Odor Threshold	No data available.

<u>Property</u>	<u>Values (Method)</u>
Melting Point / Freezing Point	-259 °C / -434 °F
Initial Boiling Point / Boiling Range	-252 °C / -422 °F
Flash Point	No data available.
Evaporation Rate	No data available.
Flammability (solid, gas)	Extremely flammable gas
Flammability Limit in Air (%):	
Upper Flammability Limit:	No data available.
Lower Flammability Limit:	No data available.
Explosion limits:	Lower: 4%
	Upper: 75%
Vapor Pressure	No data available.
Vapor Density	0.1
Specific Gravity / Relative Density	No data available.
Water Solubility	No data available.
Solubility in other solvents	No data available.
Partition Coefficient	No data available.
Decomposition temperature	No data available.
pH:	Not applicable
Autoignition Temperature	500 °C / 932 °F
Kinematic Viscosity	No data available.
Dynamic Viscosity	No data available.
Explosive Properties	No data available.
VOC Content (%)	No data available.
Density	0.0899 g/L
Bulk Density	Not applicable

10. STABILITY AND REACTIVITY

<u>Reactivity</u>	The product is non-reactive under normal conditions.
<u>Chemical stability</u>	The material is stable at 70°F (21°C), 760 mmHg pressure.
<u>Possibility of hazardous reactions</u>	None under normal processing.
<u>Hazardous polymerization</u>	Will not occur.
<u>Conditions to avoid</u>	Sources of heat or ignition.
<u>Incompatible Materials</u>	Strong oxidizing agents.
<u>Hazardous decomposition products</u>	None known under normal conditions of use.

11. TOXICOLOGICAL INFORMATION

Potential short-term adverse effects from overexposures

Inhalation	May cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination. In high concentration the gas may cause suffocation. Victim may not be aware of asphyxiation.
Eye contact	Gas or vapor is generally non-irritating to eyes. Contact with rapidly expanding gas may cause frostbite.
Skin contact	Gas or vapor is generally non-irritating to skin. Contact with rapidly expanding gas may cause frostbite.

Ingestion

Ingestion not likely.

Acute toxicological data

Name	Oral LD50	Dermal LD50	Inhalation LC50
Hydrogen 1333-74-0	-	-	> 15,000 ppm (Rat) 1 h

Delayed and immediate effects as well as chronic effects from short and long-term exposure

HYDROGEN: Hydrogen is considered to be a simple asphyxiant gas without significant potential for systemic toxicity. At very high concentrations it acts as an asphyxiant gas by diluting and displacing oxygen. Symptoms of persons exposed to oxygen deficient atmospheres include headache, dizziness, incoordination, cyanosis and narcosis. Extremely high concentrations can produce unconsciousness followed by death.

Adverse effects related to the physical, chemical and toxicological characteristics**Signs and Symptoms**

Asphyxiant gas. High concentrations in the immediate area can displace oxygen causing the feeling of suffocation and can cause headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue from oxygen deprivation. Contact with product may cause frostbite.

Acute toxicity

None known.

Skin corrosion/irritation

None known.

Serious eye damage/eye irritation

None known.

Sensitization

None known.

Mutagenic effects

None known.

Carcinogenicity

None known.

Cancer designations are listed in the table below

Name	ACGIH (Class)	IARC (Class)	NTP	OSHA
Hydrogen 1333-74-0	Not Listed	Not Listed	Not Listed	Not Listed

Reproductive toxicity

None known.

Specific Target Organ Toxicity (STOT) - single exposure

None known.

Specific Target Organ Toxicity (STOT) - repeated exposure

None known.

Aspiration hazard

Not applicable.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Not classified in terms of aquatic toxicity.

Name	Algae/aquatic plants	Fish	Toxicity to Microorganisms	Crustacea
Hydrogen 1333-74-0	-	-	-	-

Persistence and degradability

No information available.

Bioaccumulation Not expected to bioaccumulate in aquatic organisms.

Mobility in soil Expected to rapidly partition to air.

Other adverse effects No information available.

13. DISPOSAL CONSIDERATIONS

Description of Waste Residues

No information available.

Safe Handling of Wastes

Handle in accordance with applicable local, state, and federal regulations. Use personal protection measures as required. Use appropriate grounding and bonding practices. Use only non-sparking tools. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. No smoking.

Disposal of Wastes / Methods of Disposal

The user is responsible for determining if any discarded material is a hazardous waste (40 CFR 262.11). Dispose of in accordance with federal, state and local regulations.

Methods of Contaminated Packaging Disposal

Empty containers should be completely drained and then discarded or recycled, if possible. Do not cut, drill, grind or weld on empty containers since explosive residues may be present. Dispose of in accordance with federal, state and local regulations.

14. TRANSPORT INFORMATION

DOT:

UN Proper Shipping Name:	Hydrogen, Compressed
UN/Identification No:	UN 1049
Class:	2.1
Packing Group:	Not applicable.

IATA:

UN Proper Shipping Name:	Hydrogen, Compressed
UN/Identification No:	UN 1049
Transport Hazard Class(es):	2.1
Packing Group:	Not applicable.
ERG code:	10L

IMDG:

UN Proper Shipping Name:	Hydrogen, Compressed
UN/Identification No:	UN 1049
Transport Hazard Class(es):	2.1
Packing Group:	Not applicable.
EmS No:	F-D, S-U
Marine Pollutant:	No

15. REGULATORY INFORMATION

US Federal Regulatory Information:

US TSCA Chemical Inventory Section 8(b):	This product and/or its components are listed on the TSCA Chemical Inventory or are exempt.
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EPA Superfund Amendment & Reauthorization Act (SARA):

SARA Section 302: This product does not contain any component(s) included on EPA's Extremely Hazardous Substance (EHS) List.

Name	CERCLA/SARA - Section 302 Extremely Hazardous

	Substances and TPQs
Hydrogen	NA

SARA Section 304: This product does not contain any component(s) identified as an EHS or a CERCLA Hazardous substance, which in case of a spill or release may be subject to SARA reporting requirements.

Name	Hazardous Substances RQs
Hydrogen	NA

SARA Section 311/312: The following EPA hazard categories apply to this product:

Flammable
Gas under pressure
Simple asphyxiant
Hazard Not Otherwise Classified (HNOC)-Health

SARA Section 313: This product does not contain components, which if in exceedance of the de minimus threshold, may be subject to the reporting requirements of SARA Title III Section 313 Toxic Release Reporting (Form R):

Name	CERCLA/SARA 313 Emission reporting:
Hydrogen	None

State and Community Right-To-Know Regulations:

The following component(s) of this material are identified on the regulatory lists below:

Hydrogen

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1010
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Flammable - fourth degree
New Jersey - Environmental Hazardous Substances List:	SN 1010 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Canada DSL/NDL Inventory: This product and/or its components are listed either on the Domestic Substances List (DSL) or are exempt.

Notes: Not applicable.

16. OTHER INFORMATION

Prepared By Toxicology & Product Safety

Revision Notes

Revision Date: 10/08/2019

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information is intended as guidance for safe handling, use, processing, storage,

transportation, accidental release, clean-up and disposal and is not considered a warranty or quality specification. The 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, unless specified in the text.