SAFETY DATA SHEET

Hydrogen

Version	Revision Date:	SDS Number:	Date of last issue: 03-06-2020
4.0	05-24-2021	10000001228	Date of first issue: 05-24-2021

Olin Corporation (OCAP) encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

SECTION 1. IDENTIFICATION

Product name : Hydrogen

Manufacturer or supplier's details

Company name of supplier : Olin Corporation (OCAP)
Address : 190 Carondelet Plaza, Suite 1530
Clayton MO 63105
Telephone : (423) 336-4850
E-mail address : INFO@OLIN.COM
Local Emergency Contact : 1-800-424-9300
Identified uses : Chemical intermediate.
Hydrogenation
For industrial use.

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with 29 CFR 1910.1200

Flammable gases : Category 1

Gases under pressure : Compressed gas

Simple Asphyxiant

GHS label elements

Hazard pictograms :

Signal Word : Danger

Hazard Statements : Extremely flammable gas.
Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.

Precautionary Statements :

Prevention:

P210 Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.

Response:

P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 Eliminate all ignition sources if safe to do so.

Storage:
P410 + P403 Protect from sunlight. Store in a well-ventilated place.

Other hazards
None known.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Substance
Substance name : Hydrogen

CAS-No. : 1333-74-0

Components

Chemical name	CAS-No.	Concentration (% w/w)
Hydrogen	1333-74-0	>= 99 - <= 100

SECTION 4. FIRST AID MEASURES

If inhaled : Move person to fresh air. If not breathing, give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask, etc). If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

In case of skin contact : Wash off with plenty of water.

In case of eye contact : No emergency medical treatment necessary.

If swallowed : No emergency medical treatment necessary.

Most important symptoms and effects, both acute and delayed : Aside from the information found under Description of first aid measures(above)any additional important symptoms and effects are described in Section 11: Toxicology Information.

Protection of first-aiders : First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection).
If potential for exposure exists refer to Section 8 for specific personal protective equipment.

Notes to physician : Maintain adequate ventilation and oxygenation of the patient.
No specific antidote.
Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media : Do not extinguish.
Stop flow of product and allow fire to burn out.
Once product flow has stopped, small fires may be extinguished with:
Water fog or fine spray.
Dry chemical fire extinguishers.
Carbon dioxide fire extinguishers.
Foam.

Specific hazards during fire : Container may vent and/or rupture due to fire.

fighting

Hazardous combustion products	:	During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating.
Further information	:	Keep people away. Isolate fire and deny unnecessary entry. Do not extinguish. If flames are accidentally extinguished, explosive re-ignition may occur. Shut off source of fuel if possible and allow fire to burn out. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Immediately withdraw all personnel from the area in case of rising sound from venting safety device or discoloration of the container. Eliminate ignition sources. Use caution and test if material is burning before entering area. Material burns with invisible flame. For unignited vapor cloud, use water spray to knock down and control dispersion of vapors.
Special protective equipment for fire-fighters	:	Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Evacuate area. Refer to section 7, Handling, for additional precautionary measures. Keep personnel out of confined or poorly ventilated areas. Ventilate area of leak or spill. No smoking in area. Only trained and properly protected personnel must be involved in clean-up operations. Confined space entry procedures must be followed before entering the area. Eliminate all sources of ignition in vicinity of spill or released vapor to avoid fire or explosion. For large spills, warn public of downwind explosion hazard. Check area with combustible gas detector before reentering area. Ground and bond all containers and handling equipment. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.
Environmental precautions	:	Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.
Methods and materials for containment and cleaning up	:	Ground and bond all containers and handling equipment. Stop flow of gas. Use fine water spray to reduce vapors. If available, use foam to smother or suppress vapors. Isolate area until gas has dispersed.

Collect in suitable and properly labeled containers.
See Section 13, Disposal Considerations, for additional information.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling : Avoid contact with eyes.
Use with adequate ventilation.
Wash thoroughly after handling.
Keep container closed.
Do not enter confined spaces unless adequately ventilated.
Electrically bond and ground all containers, personnel and equipment before transfer or use of material.
No smoking, open flames or sources of ignition in handling and storage area.
See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.
This product is a poor conductor of electricity and can become electrostaically charged, even in bonded or grounded equipment. If sufficient charge is accumulated, ignition of flammable mixtures can occur.
Handling operations that can promote accumulation of static charges include but are not limited to mixing, filtering, pumping at high flow rates, splash filling, creating mists or sprays, tank and container filling, tank cleaning, sampling, gauging, switch loading, vacuum truck operations.

Conditions for safe storage : No smoking or open flame in storage area.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredients with workplace control parameters

Contains no substances with occupational exposure limit values.

Engineering measures : Use engineering controls to maintain airborne level below exposure limit requirements or guidelines.
If there are no applicable exposure limit requirements or guidelines, use only in enclosed systems or with local exhaust ventilation.
Exhaust systems should be designed to move the air away from the source of vapor/aerosol generation and people working at this point.
Lethal concentrations may exist in areas with poor ventilation.

Personal protective equipment

Respiratory protection : Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines.
If there are no applicable exposure limit requirements or guidelines, use an approved respirator.
When respiratory protection is required, use an approved positive-pressure self-contained breathing apparatus or positive-pressure airline with auxiliary self-contained air supply.
For emergency conditions, use an approved positive-

pressure self-contained breathing apparatus.
In confined or poorly ventilated areas, use an approved self-contained breathing apparatus or positive pressure air line with auxiliary self-contained air supply.

Hand protection

Remarks : Chemical protective gloves should not be needed when handling this material. Consistent with general hygienic practice for any material, skin contact should be minimized.

Eye protection : Use safety glasses (with side shields).

Skin and body protection : No precautions other than clean body-covering clothing should be needed.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	gas
Color	:	Colorless
Odor	:	No test data available
Odor Threshold	:	Not available
pH	:	Not applicable
Freezing point	:	-434.00 °F / -258.89 °C
Melting point/range		-434.00 °F / -258.89 °C
Pour point		
Softening point		
Boiling point/boiling range	:	-423.99 °F / -253.33 °C
Evaporation rate	:	Not available
Flammability (liquids)	:	Not expected to be a static-accumulating flammable liquid.
Self-ignition	:	The substance or mixture is not classified as pyrophoric.
Upper explosion limit / Upper flammability limit	:	74 %(V)
Lower explosion limit / Lower flammability limit	:	4 %(V)
Vapor pressure	:	No data available
Relative vapor density	:	Not available
Relative density	:	0.069 (32 °F / 0 °C)
Solubility(ies)		
Water solubility	:	0.0162 g/l (70 °F / 21 °C) Method: Measured

Partition coefficient: n-octanol/water	:	log Pow: 0.45 Method: Estimated. Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Autoignition temperature	:	986 - 1094 °F / 530 - 590 °C
Decomposition temperature	:	No data available
Viscosity		
Viscosity, dynamic	:	No data available
Viscosity, kinematic	:	Not applicable
Explosive properties	:	No test data available
Oxidizing properties	:	No data available
Molecular weight	:	2.02 g/mol

Note: These are the Reference Points for these Physical Properties listed above, unless otherwise noted in their respective Physical Property value information: Boiling Point at 760 mmHg; Evaporation Rate Butyl Acetate = 1; Relative Vapor Density Air = 1; and Relative Density Water = 1.
NOTE: The physical data presented above are typical values and should not be construed as a specification.

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	No data available
Chemical stability	:	Stable.
Possibility of hazardous reactions	:	Polymerization will not occur.
Conditions to avoid	:	None known.
Incompatible materials	:	Avoid contact with oxidizing materials.
Hazardous decomposition products	:	Does not decompose.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Components:

Hydrogen:

Acute oral toxicity	:	Remarks: Single dose oral LD50 has not been determined.
Acute inhalation toxicity	:	Remarks: In confined or poorly ventilated areas, vapor can easily accumulate and can cause unconsciousness and death due to displacement of oxygen. For respiratory irritation and narcotic effects: No relevant data found. Remarks: The LC50 has not been determined.
Acute dermal toxicity	:	Remarks: The dermal LD50 has not been determined.

Skin corrosion/irritation

Components:

Hydrogen:

Result	:	No skin irritation
Remarks	:	No hazard from gas.

Serious eye damage/eye irritation

Components:

Hydrogen:

Result	:	No eye irritation
Remarks	:	No hazard from gas.

Respiratory or skin sensitization

Components:

Hydrogen:

Remarks	:	For skin sensitization: No relevant data found.
Remarks	:	For respiratory sensitization: No relevant data found.

Germ cell mutagenicity

Components:

Hydrogen:

Genotoxicity in vitro	:	Remarks: No relevant data found.

Carcinogenicity

Components:

Hydrogen:

Remarks	:	No relevant data found.

IARC No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

OSHA No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

NTP No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

Reproductive toxicity

Components:

Hydrogen:

Effects on fertility	:	Remarks: No relevant data found.
Effects on fetal development	:	Remarks: No relevant data found.

STOT-single exposure

Components:

Hydrogen:

Assessment	:	Evaluation of available data suggests that this material is not an STOT-SE toxicant.

Repeated dose toxicity

Components:

Hydrogen:

Remarks	:	No relevant data found.

Aspiration toxicity

Components:

Hydrogen:

Based on available information, aspiration hazard could not be determined.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Components:

Hydrogen:

Toxicity to fish	:	Remarks: Not expected to be acutely toxic to aquatic organisms.

Persistence and degradability

Product:

ThOD	:	7.94 mg/mg

Bioaccumulative potential

Components:

Hydrogen:

Partition coefficient: n-	:	log Pow: 0.45

octanol/water	Method: Estimated. Remarks: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).

Mobility in soil
No data available

Other adverse effects
No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	AS YOUR SUPPLIER, WE HAVE NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER.

SECTION 14. TRANSPORT INFORMATION

International Regulations

UNRTDG

UN number	:	UN 1049
Proper shipping name	:	HYDROGEN, COMPRESSED
Class	:	2.1
Packing group	:	Not assigned by regulation
Labels	:	2.1

IATA-DGR

UN/ID No.	:	UN 1049
Proper shipping name	:	Hydrogen, compressed
Class	:	2.1
Packing group	:	Not assigned by regulation
Labels	:	Flammable Gas
Packing instruction (cargo aircraft)	:	200
Packing instruction (passenger aircraft)	:	Not permitted for transport

IMDG-Code

UN number	:	UN 1049
Proper shipping name	:	HYDROGEN, COMPRESSED
Class	:	2.1

Packing group	:	Not assigned by regulation
Labels	:	2.1
EmS Code	:	F-D, S-U
Marine pollutant	:	no
Remarks	:	Stowage category E

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

Domestic regulation

49 CFR

UN/ID/NA number	:	UN 1049
Proper shipping name	:	Hydrogen, compressed
Class	:	2.1
Packing group	:	Not assigned by regulation
Labels	:	FLAMMABLE GAS
ERG Code	:	115
Marine pollutant	:	no

Special precautions for user

The transport classification(s) provided herein are for informational purposes only, and solely based upon the properties of the unpackaged material as it is described within this Safety Data Sheet. Transportation classifications may vary by mode of transportation, package sizes, and variations in regional or country regulations.

SECTION 15. REGULATORY INFORMATION

EPCRA - Emergency Planning and Community Right-to-Know

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

SARA 311/312 Hazards	:	Gases under pressure Flammable (gases, aerosols, liquids, or solids) Simple Asphyxiant
SARA 313	:	This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

US State Regulations

Pennsylvania Right To Know

Hydrogen	1333-74-0

California Prop. 65

This product does not contain any chemicals known to the State of California to cause cancer, birth, or any other reproductive defects.

International Regulations

Montreal Protocol (Ozone Depleting Substances)	:	Not applicable
Rotterdam Convention (Prior Informed Consent)	:	Not applicable
Stockholm Convention (Persistent Organic Pollutants)	:	Not applicable

The ingredients of this product are reported in the following inventories:

TCSI	:	All intentional components are listed on the inventory, are exempt, or are supplier certified.
TSCA	:	All substances listed as active on the TSCA Inventory or are not required to be listed.
AICS	:	All intentional components are listed on the inventory, are exempt, or are supplier certified.
DSL	:	All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.
ENCS	:	not determined
ISHL	:	not determined
KECI	:	All intentional components are listed on the inventory, are exempt, or are supplier certified.
PICCS	:	All intentional components are listed on the inventory, are exempt, or are supplier certified.
IECSC	:	All intentional components are listed on the inventory, are exempt, or are supplier certified.
NZIoC	:	All intentional components are listed on the inventory, are exempt, or are supplier certified.
CH INV	:	All intentional components are listed on the inventory, are exempt, or are supplier certified.

TSCA list

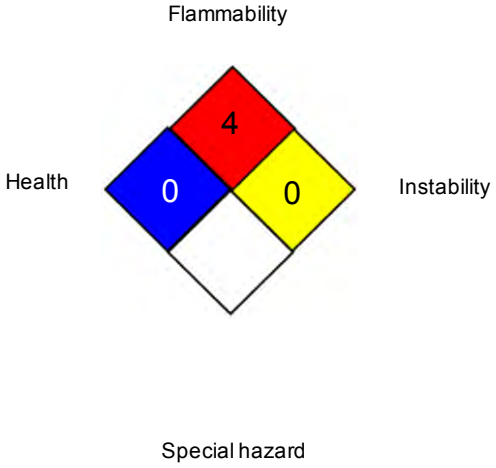
No substances are subject to a Significant New Use Rule.

No substances are subject to TSCA 12(b) export notification requirements.

SECTION 16. OTHER INFORMATION

Further information

NFPA 704:



Full text of other abbreviations

AICS - Australian Inventory of Chemical Substances; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; HMIS - Hazardous Materials Identification System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; MSHA - Mine Safety and Health Administration; n.o.s. - Not Otherwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

Revision Date : 05-24-2021

Olin Corporation (OCAP) urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given.Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

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