SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

- Product name: Hydrogen
- Product Number: 00473
- Brand: Sigma-Aldrich
- Index-No.: 001-001-00-9
- CAS-No.: 1333-74-0

1.2 Relevant identified uses of the substance or mixture and uses advised against

- Identified uses: Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

- Company: Sigma-Aldrich Inc.
  3050 SPRUCE ST
  ST. LOUIS MO 63103
  UNITED STATES
- Telephone: +1 314 771-5765
- Fax: +1 800 325-5052

1.4 Emergency telephone

- Emergency Phone #: 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

- Flammable gases (Category 1), H220
- Gases under pressure (Compressed gas), H280
- Simple Asphyxiant,

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

- Pictogram
- Signal word: Danger
Hazard statement(s)
H220 Extremely flammable gas.
H280 Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.

Precautionary statement(s)
P210 Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 Eliminate all ignition sources if safe to do so.
P410 + P403 Protect from sunlight. Store in a well-ventilated place.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen</td>
<td>Flam. Gas 1; Press. Gas Compr. Gas; SA ; H220, H280</td>
<td>&lt;= 100 %</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Consult a physician. Show this material safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.
4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media
Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas. For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Clean up promptly by sweeping or vacuum.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Avoid inhalation of vapor or mist.

Advice on protection against fire and explosion
Use explosion-proof equipment. Advice on protection against fire and explosion
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday. For precautions see section 2.2.
7.2 Conditions for safe storage, including any incompatibilities

**Storage conditions**
Keep container tightly closed in a dry and well-ventilated place.

**Storage class**
Storage class (TRGS 510): 2B: Aerosol cans and lighters

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

---

**SECTION 8: Exposure controls/personal protection**

8.1 Control parameters

**Ingredients with workplace control parameters**
Contains no substances with occupational exposure limit values.
Hazardous components without workplace control parameters

8.2 Exposure controls

**Appropriate engineering controls**
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

**Personal protective equipment**

**Eye/face protection**
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Splash contact
Material: butyl-rubber
Minimum layer thickness: 0.3 mm
Break through time: 120 min
Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

Data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the EC approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
Impervious clothing, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.
**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

---

### SECTION 9: Physical and chemical properties

#### 9.1 Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a) Appearance</strong></td>
<td>Form: Compressed gas</td>
</tr>
<tr>
<td></td>
<td>Color: colorless</td>
</tr>
<tr>
<td><strong>b) Odor</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>c) Odor Threshold</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>d) pH</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>e) Melting point/freezing point</strong></td>
<td>Melting point/range: -259.2 °C (-434.6 °F) - lit.</td>
</tr>
<tr>
<td><strong>f) Initial boiling point and boiling range</strong></td>
<td>-252.8 °C -423.0 °F - lit.</td>
</tr>
<tr>
<td><strong>g) Flash point</strong></td>
<td>&lt; -150 °C (&lt; -238 °F) - closed cup</td>
</tr>
<tr>
<td><strong>h) Evaporation rate</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>i) Flammability (solid, gas)</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>j) Upper/lower flammability or explosive limits</strong></td>
<td>Upper explosion limit: 74.2 %(V) Lower explosion limit: 4 %(V)</td>
</tr>
<tr>
<td><strong>k) Vapor pressure</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>l) Vapor density</strong></td>
<td>0.08</td>
</tr>
<tr>
<td><strong>m) Density</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Relative density</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>n) Water solubility</strong></td>
<td>0.00196 g/l at 0 °C (32 °F)</td>
</tr>
<tr>
<td><strong>o) Partition coefficient: n-octanol/water</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>p) Autoignition temperature</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>q) Decomposition temperature</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>r) Viscosity</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>s) Explosive properties</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>t) Oxidizing properties</strong></td>
<td>No data available</td>
</tr>
</tbody>
</table>

#### 9.2 Other safety information
SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Oxidizing agents

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
Oral: No data available
Inhalation: No data available
Symptoms: In high doses:, Unconsciousness, risk of suffocation
Dermal: No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
No data available

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

Reproductive toxicity
No data available
Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

RTECS: MW8900000
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12: Ecological information

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

DOT (US)
UN number: 1950 Class: 2.1
Proper shipping name: Aerosols
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG
UN number: 1950   Class: 2.1   EMS-No: F-D, S-U
Proper shipping name: AEROSOLS

IATA
UN number: 1950   Class: 2.1
Proper shipping name: Aerosols, flammable

SECTION 15: Regulatory information

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
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.

SARA 311/312 Hazards
Fire Hazard, Sudden Release of Pressure Hazard

Massachusetts Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen</td>
<td>1333-74-0</td>
<td>1993-02-16</td>
</tr>
</tbody>
</table>

Pennsylvania Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen</td>
<td>1333-74-0</td>
<td>1993-02-16</td>
</tr>
</tbody>
</table>

New Jersey Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen</td>
<td>1333-74-0</td>
<td>1993-02-16</td>
</tr>
</tbody>
</table>

California Prop. 65 Components
This product does not contain any chemicals known to the State of California to cause cancer, birth, or any other reproductive defects.

SECTION 16: Other information

Further information
Copyright 2020 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only.
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See
www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 8.1 Revision Date: 09/13/2021 Print Date: 09/10/2022