

MATERIAL SAFETY DATA SHEET

according to EU Regulation 453/2010 and
Rules about MSDS Content (Official gazette: "Sl. glasnik RS", 100/11)

HYDROGEN

Version: 4 – this version replaces all previous versions

Revision: 1

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PETROHEMIJA

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

1.1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION

Chemical name	Hydrogen
Index No	001-001-00-9
CAS No	1333-74-0
EC No	215-605-7
Trade name	Hydrogen
Reach registration No.	n.a.

1.2 IDENTIFIED WAYS OF CHEMICAL UTILIZATION AND NOT RECOMMENDED WAYS OF UTILIZATION

Ways of the chemical utilization	Chemical reagent, hydrogenization, welding
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1.3 SUPPLIER'S DATA

Name of Supplier	"HIP-Petrohemija" Pancevo Spoljnostarcevacka 82 26000 Pancevo Republic of Serbia +381 13 30 70 00
Address and phone No.	
E-mail of person in charge for Safety Data Sheet	iboja.rasa@hip-petrohemija.rs

1.4 EMERGENCY PHONE NUMBERS

Emergency Contact (24h)	See Section 16. for the list of telephone numbers of poison centers in the European Economic Area
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2. HAZARDS IDENTIFICATION

2.1 CLASSIFICATION OF CHEMICAL

Regulations about classification, packaging, labelling and advertising chemicals and certain articles in accordance with globally harmonized system for classification and labelling UN („Sl.glasnik RS“ No. 105/13)

Infl.gas. 1; H220
Gas under pressure
(compressed gas)

For full name of hazard classes and information dangers see Section 16

Harmful impact on environment	There are no data about detrimental effects of hydrogen to environment.
Harmful physical-chemical impact	Very easily inflammable gas. Forms explosive mixture with air. Combustion with invisible flame.

2.2 LABELLING ELEMENTS

Pictograms of danger	
Warning word	Danger!
Information about danger	H220
Information about precautionary measures	P210, P377, P381, P403

For full name and information about precautionary measures see Section 16

2.3 OTHER HAZARDS

Hydrogen does not fulfill criteria for identification as persistent – bioaccumulative – toxic (PBT) or very persistent – very bioaccumulative (vPvB).

3. COMPOSITION / INFORMATION ON INGREDIENTS

3.1 INFORMATION ABOUT SUBSTANCE INGREDIENTS

Name of chemical	Index No.	Concentration (%(m/m))
Hydrogen	001-001-00-9	≥ 95
Methane	601-001-00-4	≤ 5

4. FIRST AID MEASURES

4.1 FIRST AID MEASURES DESCRIPTION

General advice	Mild asphyxiant.
Inhalation	In the case of unwanted effects the exposed person should be removed to non-contaminated area. If the exposed person stopped breathing perform artificial respiration. In the case of shortness of breath, qualified personnel should give oxygen. Seek for medical help immediately.
Skin contact	In the case of frostbites or cold burns, affected skin should be rinsed with plenty of lukewarm water. DO NOT USE hot water. If lukewarm water is not available, gently cover affected parts with blankets. Seek for medical help immediately.
Eye contact	Immediately rinse eyes with plenty of water, with lifting both upper and lower lids from time to time, until the eyes are thoroughly rinsed. Seek for medical help immediately.
Ingestion	If large quantities are ingested seek for medical help immediately.

4.2 MOST SIGNIFICANT SYMPTOMS AND EFFECTS, ACUTE AND DELAYED

Inhalation	Mild asphyxiant, may cause nausea, dizziness, choking, short breathing, unconsciousness, loss of coordination, headache.
Skin contact	Contact with rapidly expanding hydrogen gas may cause frostbites.
Eye contact	Contact with rapidly expanding hydrogen gas may cause frostbites.
Ingestion	Not the way of exposure.

4.3 EMERGENCY MEDICAL HELP AND SPECIAL TREATMENTS

Apply first-aid measures. Immediately search medical help, and in case of breathing blockage apply artificial respiration.

5. FIRE-FIGHTING MEASURES

5.1 FIRE-FIGHTING MEDIA

Suitable extinguishing media	Dry powder, foam, carbon-dioxide, water or sprayed water. Use plenty of water for cooling containers exposed to fire in order to protect employees. Do not try to extinguish fire while gas is leaking except it is possible to isolate and cut the gas source.
Unsuitable extinguishing media:	Do not use direct water jet.

5.2 SPECIAL DANGERS WHICH MAY BE CAUSED BY SUBSTANCES/MIXTURES

No hazardous combustion products.

5.3 ADVICE FOR FIRE-FIGHTERS

Special protective measures during fire-fighting:	Approach to fire carefully because the flame is of very high temperature and practically invisible. Do not extinguish the fire until the hydrogen leakage is stopped. Use water jet for cooling tanks exposed to fire. Use plenty of water in form of mist or spray. Immediately step away in the case there is whistling sound coming from the safety valves or any change in colour of the tanks exposed to fire. Remove unemployed, isolate the danger area and forbid entering the area. Evacuate if the fire get out of control or if tanks are directly exposed to fire. Let whole quantity of hydrogen to be incinerated. Avoid inhalation of matters or products of incineration.
Special protective equipment for fire-fighters:	Set of protective equipment for fire-fighters in accordance with ref. Standard SRPS EN 469, protective fire-fighters gloves (ref. Standard SRPS EN 659) and shoes, in combination with appropriate equipment for respiratory system protection. (ref. Standard SRPS EN 137).

6. ACCIDENTAL RELEASE MEASURES

6.1 PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT, AND MEASURES IN CASE OF ACCIDENTS

Immediately remove personnel to a safety zone. Forbid approach to the affected area. Wear personal protective equipment. If dangerous vapours appear wear respiratory mask.

6.2 ENVIRONMENTAL PRECAUTIONS

Do not let product enter sewage systems. Prevent further leakage if it can be safely done. Extenuate concentration of gasses / steams / mist by using water jet.

6.3 MEASURES TO BE UNDERTAKEN AND MATERIALS FOR PREVENTION OF EXPANSION AND SANATION

Evacuate the area. Provide ventilation. Do not touch the spilled material. Smoking is not allowed, neither is utilization of open fires within storage facilities or places where hydrogen is stored or manipulated with. Eliminate ignition sources. All equipment must be grounded and ensured in such a way to eliminate existance of any static electricity. In the case of leakage check the area.

6.4 REFERENCES TO OTHER SECTIONS

See sections 8 and 13.

7. HANDLING AND STORAGE

7.1 PRECAUTIONS FOR SAFE HANDLING

Handle in fully closed, grounded, properly designed and approved systems under pressure. Provide adequate ventilation. Avoid inhalation. Keep away from hot and non-compatible materials. All tools and systems for material transport must be grounded in order to avoid creation of static electricity. Undertake necessary precautions in case of cold cutting or reparation of lines, or during cleaning and disposal of empty tanks. Wear appropriate protective equipment including thermally resistant gloves. Smoking is forbidden as well as using open fires in the area where this material is stored, used or handled.

7.2 CONDITIONS FOR SAFE STORAGE, INCLUDING INCOMPATIBILITIES

Storage space must be clearly identified, properly lighted, protected against damages and accessible only to trained and authorized personnel. Store material in grounded, properly designed and approved tanks under pressure away from incompatible materials. Store and use away from heat resources, sparkles, open fires, or any other ignition source. Store in accordance with applicable standards and regulations for liquid gasses that relates to vessels, valves, pipes, buildings and premises, within allowable limits and allowable distances. Provide adequate systems for fire extinguishing within the storage space (i.e. sprinkler system, mobile fire extinguishing apparatus) for inflammable gasses. Safety valves for under-pressure vessels should be above the ground and able to keep the whole content.

7.3 SPECIAL WAYS OF UTILIZATION

No data.

8. EXPOSURE CONTROLS

8.1 EXPOSURE CONTROL PARAMETERS

No limit values of exposure are prescribed.

8.2 EXPOSURE CONTROL AND PERSONAL PROTECTION

Eyes/face protection	Goggles or eyes protection combined with insulation apparatus. (ref.standard SRPS EN 166)
Skin protection (hands/other body parts)	Use appropriate chemically resistant gloves and protective clothes (ref.standard SRPS EN 374)
Respiratory system protection	Respiratory system protection is not required but it is recommended (ref.standard SRPS EN 137)
Environmental exposure control	Environmental exposure control to be performed in accordance with the existing regulations.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 INFORMATION ABOUT CHEMICAL GENERAL PHYSICAL AND CHEMICAL PROPERTIES

Form	Gas at ambient conditions
Colour	Colourless
Odour	Odourless
Odour threshold	N/A
pH	N/A
Melting point/Freezing point	-259,15°C
Boiling point (Boiling range)	-252,7°C
Flash point	No data
Evaporation rate	No data
Inflammability	Very easily inflammable
Lower limit of inflammability (explosivity)	4%
Upper limit of inflammability (explosivity)	75%

Vapour pressure	N/A
Vapour density (air=1)	0,07
Relative density at 20 °C	0,08 kg/m ³
Solubility	0,019
Partition coef. n-octanol/water (Log Kow)	No data
Self-ignition temperature	570°C
Decomposition temperature	No data
Viscosity	No data
Explosive properties	No data
Oxidizing properties	No data

9.2 OTHER DATA

No data

10. STABILITY AND REACTIVITY

10.1 REACTIVITY

No special risks from reactions with other chemicals under normal utilization conditions.

10.2 CHEMICAL STABILITY

This product is stable at ambient temperature and pressure.

10.3 POSSIBILITY OF DANGEROUS REACTIONS CREATION

Vapours may form explosive mixture with air.

10.4 CONDITIONS TO BE AVOIDED

Avoid heat, sparkles, flame, and other sources of ignition. Tanks may break or explode if exposed to heat.

10.5 NON-COMPATIBLE MATERIALS

Metals, oxidizing agents, metal oxides, inflammable materiala, halogens, metal salts, halogenated hydrocarbons, air, chlorine, litium, oxigene.

10.6 DANGEROUS DECOMPOSITION PRODUCTS

Product is stable, no dangerous products of decompositiion are expected as a result of utilization, storage, leakage, or heating the chemicals.

11. TOXICOLOGICAL INFORMATION ⁽¹⁾

11.1 DATA ABOUT TOXIC EFFECTS OF THE SUBSTANCE

Acute toxicity	LC ₅₀ inhalation, rat, for gases and vapours	> 15000 ppm (1h)
Corrosive damage of skin/irritation	No data	
Hard damage of eye / eye irritation	No data	
Sensibilityof respirtory organs or skin	No data	
Germ cells mutagenicity	Not known to have mutagenity effects	
Carcinogenicity	Does not cause carcinogenicity	
Reproductive toxicity	Not known to affect reproductivity	
Specific target organ toxicity - JI	No data	
Specific target organ toxicity - VI	No data	
Danger of aspiration	No data	

12. ECOLOGICAL INFORMATIONS ⁽¹⁾

12.1 TOXICITY

Acute toxicity	96 h LC ₅₀ (fish)	No data
	48 h LC ₅₀ (crabs)	No data
	96 h ErC ₅₀ (za algae)	No data

	M - factor	/
Chronical toxicity	96 h LC ₅₀ (fish)	No data
	48 h LC ₅₀ (crabs)	No data
	96 h ErC ₅₀ (algae)	No data
	M - factor	/

12.2 PERSISTENCY AND BIODEGRADATION

Biodegradation No data

12.3 BIOACCUMULATION POTENTIAL

Bioaccumulativity No data

12.4 MOBILITY IN EARTH

Adsorption/desorption N/A

12.5 RESULTS PBT AND vPvB ESTIMATION

PBT I vPvB No data

12.6 OTHER DETRIMENTAL EFFECTS

Effects to environment No data

Photochemical ozone creation No data

Endocrine system disorder No data


13. DISPOSAL

13.1 WASTES TREATMENT METHODS


Disposal of unused products and packaging Disposal of unused products is performed in accordance with the waste treatment regulations – the remainings of unused product is to be delivered to an authorized operator or to a special space provided for dangerous waste disposal. This product is not packed.

14. TRANSPORT INFORMATION


Road (ADR) / Railway (RID) / Water (ADN) transport

Corresponding transport name	HYDROGEN, COMPRESSED	Labelling
UN number	1049	
Transport hazard class	2 (2.1 Inflammable gas)	
Classification code	1F	
Hazard ID number	23	
Packaging group	/	

International maritime transport (IMDG)

Corresponding transport name	HYDROGEN, COMPRESSED	Labelling
UN number	1049	
IMDG class	2 (2.1 Inflammable gas)	
EmS classification	F-D, S-U	
Packaging group	/	

International air transport (IATA/ICAO)

Corresponding transport name	HYDROGEN, COMPRESSED	Labelling 
UN number	1049	
ICAO/IATA class	2 (2.1 Inflammable gas)	
Packaging group	/	

14.1 UN NUMBER	UN 1049
14.2 UN NAME FOR CARGO IN TRANSPORT	HYDROGEN, COMPRESSED
14.3 HAZARD CLASS IN TRANSPORT	2 (2.1 Inflammable gas)
14.4 PACKAGING GROUP	/
14.5 HAZARDS TO ENVIRONMENT	
ADR	Yes
RID	Yes
ADN	Yes
IMDG	Yes
14.6 SPECIAL PRECAUTIONS FOR USERS	Stick to the measures described under Section 7 – Handling and Storage
14.7 BULK TRANSPORT	N/A

15. REGULATORY INFORMATION
15.1 REGULATIONS ABOUT SAFETY, HEALTH AND ENVIRONMENT
Regulation about the List of dangerous materials and their quantities and criteria for establishing the type of document produced by operator of seveso unit, i.e. complex. ("Sl.gl. RS." No.41/10) Table I: <i>List of dangerous materials and their limited quantities Rb. 15, limited quantity in tons 5-50</i>
15.2 CHEMICAL SAFETY ASSESSMENT
Chemical safety assessment has not been done.

16. OTHER INFORMATION		
Advice on training	Personnel handling with this product must be acquainted with its hazardous properties, with principles of health and ecological protection related to this product and first aid measures.	
Recommendation for utilization	This product is intended only for professional utilization. Use only in industries.	
Full name of hazard classes, information about hazards and information about precautionary measures	Infl.gas. 1	Inflammable gasses, category 1
	Gas.under pressure	Gasses under pressure
	H220	Very inflammable gas
	P210	Keep away from heat sources / sparkles / open fire / hot surfaces. – Smoking is forbidden
	P377	Fire with gas leakage: Do not extinguish, except in cases when leakage can be safely stopped
	P381	Remove all sources of fire, if it is possible to be done safely.

	P403	Store in place with good ventilation
Modifications and amendments to the Safety Data Sheet	Changes were made in subsection 2.1 and section 16 for the purpose of classification and labeling only with the "Regulation on classification, packaging, labeling and advertising chemicals and certain products in accordance with the Globally Harmonized System for classification and labeling UN" („Sl.glasnik RS“ No. 105/13)	
Sources used for key information when preparing Safety Data Sheet	⁽¹⁾ ECHA – European Chemicals Agency (http://echa.europa.eu/) ESIS - European Chemical Substances Information System (http://esis.jrc.ec.europa.eu/)	

List of abbreviations

ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
ADR	European Agreement concerning the International Carriage of Dangerous Goods by inland
CAS	Chemical Abstract Service
ErC ₅₀	Half maximal effective concentration
EU	European Union
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IMDG	International Maritime Dangerous Goods
LC ₅₀	Lethal Concentration
LD ₅₀	Lethal Dose
M-factor	M-factor is a coefficient used to multiply concentration of a substance classified as hazardous to aquatic environment, acute, category 1, or chronic, category 1, which is used in the summing method for classification of a mixture containing the substance
RID	International Rule for Transport of Dangerous Substances by Railway
TWA	Time Weighted Averages

LIST OF TELEPHONE NUMBERS OF POISON CENTRES IN THE EUROPEAN ECONOMIC AREA

AUSTRIA (Vienna Wien)	+43 1 40 400 2222
BELGIUM (Brussels Bruxelles)	+32 70 245 245
BULGARIA (Sofia)	+359 2 9154 409 / +359 887 435 325
CZECH REPUBLIC (Prague Praha)	+42 2 2491 9293 or +42 2 2491 5402
DENMARK (Copenhagen)	+45 35 31 54 04
FINLAND (Helsinki)	+358 9 471 977
FRANCE (Paris)	+33 1 40 05 48 48
GERMANY (Berlin)	+49 30 450 653565
GREECE (Athens Athinai)	+30 10 779 3777
HUNGARY (Budapest)	+36 80 20 11 99
ICELAND (Reykjavik)	+354 525 111, +354 543 2222
IRELAND (Dublin)	+353 1 8379964
ITALY (Rome)	+39 06 305 4343
LATVIA (Riga)	+371 704 2468
LITHUANIA (Vilnius)	+370 2 36 20 52, +370 2 36 20 92
NETHERLANDS (Bilthoven)	+31 30 274 88 88
NORWAY (Oslo)	+47 22 591300

POLAND (Gdansk)	+48 58 301 65 16 or +48 58 349 2831
PORTUGAL (Lisbon Lisboa)	808 250 143 (for use only in Portugal), +351 21 330 3284
ROMANIA (Bucharest)	+40 21 230 8000;
SLOVAKIA (Bratislava)	+421 2 54 77 4 166
SLOVENIA (Ljubljana)	+ 386 41 650 500
SPAIN (Barcelona)	+34 93 227 98 33 or +34 93 227 54 00 bleep 190
SWEDEN (Stockholm)	+46 8 33 12 31 (International) 112 (National)
UNITED KINGDOM (London)	0870 243 2241