MATERIAL SAFETY DATA SHEET

(According to GHS rev. 5)

1-BUTENO

1.IDENTIFICATION

Company: YPF S.A. **Address: Av. Macacha Güemes n° 515** **CP C1106BKK** **Buenos Aires - ARGENTINA** **Tel# (+ 5411) 5441-2000** **Fax# (+ 5411) 5441-5796**	**Commercial name:** 1-BUTENE **Chemical name:** 1-Butene.
	Synonyms: Butylene. Alpha-butylene.
	Emergency Telephone: **Argentina: 0800-222-2933** **Other countries: (+5411) 4613-1100**

2.HAZARD IDENTIFICATION

2.1 LABEL ELEMENTS

Pictograms		{Sección 2 - Símbolos Imágenes 2}	{Sección 2 - Símbolos Imágenes 3}
Warning word			
Hazard statement			
Classification criteria			
Other regulations			

OTHER HAZARDS

3.COMPOSITION/INFORMATION ON INGREDIENTS

General composition: 1-Butene.

Main components	Range %	Classification	S Phrases
1-Butene.	100	F+; R12	S (2)-9-16-33

4. FIRST-AID MEASURES

Inhalation: Move the affected person to fresh air. If breathing is difficult, administer oxygen; in case of respiratory arrest, apply artificial respiration. Call for medical attention.

Ingestion/Aspiration: Not probable.

Contact skin/eyes: In case of local frostbite, wash the affected area and remove contaminated clothes after wetting them properly, if they are not adhering to the skin. Do not rub the affected part. In contact with eyes, immediately flush with plenty of water for at least 15 minutes. Obtain medical aid as soon as possible.

General measures: Call for medical attention.

5. FIRE-FIGHTING MEASURES

Extinguishing agents: Water spray, dry chemicals, foam.

Non suitable extinguishing agents: WATER SHOULD NEVER BE USED DIRECTLY.

Combustion products: CO_2, H_2O and CO (in defect of oxygen).

Special measures: Do not extinguish fire until flow is shut. Move containers from fire area if possible without risk. Apply cooling water to sides of containers exposed to flames until well after fire is out. Stay away from containers. For massive fire in cargo area, use unmanned hose holder or monitor nozzles to avoid risks. If the fire is impossible to control, withdraw from area and let fire burn. Consult and follow existing emergency standard procedures.

Special hazards: Extremely flammable/combustible product. May be ignited by heat, sparks, static electricity or flames. Vapours are heavier than air and may travel substantial distances to remote ignition sources and flash back. Vapour displaces air in low lying and confined spaces, creating risk of asphyxia. Containers without security valves may explode after exposure to high temperatures. Empty containers are as dangerous as full ones. Vapour explosion hazard in confined areas, outdoors or in pipes. Runoff to sewer is especially dangerous due to fire and explosion hazard.

Protective equipment: Heat-resistant suit and gloves. Self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

Environmental precautions: The product suffers strong evaporation; therefore it does not present water or soil contamination potential. Prevent spreading through waterways and sewers.	**Personal precations:** Isolate the area. Keep unnecessary people away. Do not smoke. Eliminate all ignition sources (open flame, sparks). Avoid electrostatic charges.
Cleanup methods: Small spillages: Let evaporate. Large spillages: Dilute vapours with water spray and let evaporate.	**Personal protection:** Self-contained breathing apparatus in presence of high vapours concentration. Heat-resistant suit and gloves. Antistatic safety footwear. Safety shut goggles.

7. HANDLING AND STORAGE

Handling:

General precautions: Wear appropriate protective clothing to avoid contact with liquefied product and respiratory protection if gas may be inhaled. Keep away from ignition sources. Do not weld or cut near containers. Avoid static charge accumulation. Ground and bond all lines and equipment.

Specific conditions: Good local exhaust ventilation in confined areas (according to legislation in force). Working spark resistant equipment and tools. In cylinder filling operations or handling of containers, use appropriate impervious suits and antistatic footwear; it is recommended in this operations to wear goggles or security mask to avoid possible splashes. Qualified personal and special existing safety manuals and codes should be used during bulk loading, cleaning and maintaining tanks or containers (tanks must be empty before any inspection by trained personal is carried out).

Specific Use: Comonomer for high and low-density polyethylene. Production of polybutenes, butylene oxide, etc.

Storage:

Temperature and decomposition products: NP

Dangerous reactions: Extremely flammable/combustible product. The liquid has a marked tendency to build up static charge when transferred by pipelines.

Storage conditions: Containers product resistant, properly identified, placed in appropriate areas. For indoor storage, use areas prepared for flammable gas storage. Outdoor or detached storage is preferred. Protect against physical damage and fire. In areas where liquefied gases storage is under in force legislation, automatic fire fighting systems should be fitted. Gas detectors are recommended.

Incompatible materials: Oxidants agents.

8.EXPOSURE CONTROLS/PERSONAL PROTECTION

Personal protection:

Eye protection: Safety goggles or face-shield.

Respiratory protection: Self-contained breathing apparatus if gas may be inhaled.

Skin protection: Gloves and antistatic suit and footwear.

Other protective equipment: Showers and eye-washers in working area.

General precautions: Avoid liquefied product contact and gas inhalation. Contaminated clothing must be quickly wet to avoid frostbite and possible inflammation. Remove wet clothes if they are not adhered to the skin.

Specific hygiene measures: Do not smoke in areas where the product is stored or handled.

Exposure controls: They are difficult to detect in air by odour, when not odourized.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Gas.	**pH:**
Colour: Colourless.	**Odour:** Aromatic.
Boiling point: -6.3 ^{o}C (-20.7^{o}F)	**Melting/Freezing point:** -185.3^{o}C (-301.5^{o}F)
Flash point: -80 ^{o}C (-112^{o}F) C/C	**Autoignition temperature:** 384 ^{o}C (723^{o}F)
Explosive properties: LEL: 1.6% UEL: 9.3%	**Oxidizing properties:**
Vapour pressure: 3480 mm Hg at 21^oC	**Density:** 0.577 g/cm^3 at 25 ^{o}C
Surface tension:	**Viscosity:**
Vapour density: 1.94 (air: 1)	**Partition coefficient (n-octanol/water):** log $K_{octanol/water}$: 2.40
Water solubility: 0.221 g/l at 25^{o}C	**Solubility:** Petroleum solvents.
Other data: Molecular weight: 56.11 g/mol Flammable limits: LFL: 1.6% vol. UFL: 10% vol.	

10. STABILITY AND REACTIVITY

Stability: Extremely flammable and combustible.	**Conditions to avoid:** Exposure to flames, heat, sparks and static electricity.
Materials to avoid: Oxidants agents.	
Hazardous decomposition/combustion products: CO (in defect of oxygen), CO_2, H_2O.	
Polymerizations risk: NP	**Conditions to avoid:** NP

11. TOXICOLOGICAL INFORMATION

Routes of exposure: Inhalation is the most frequent route of exposure. Contact with skin and eyes. Aspiration into lungs and ingestion are unlikely, at room pressure and temperature the product is a gas.

Acute and chronic effects: The product is a simple asphyxiant due to oxygen removal from air. May cause harmful central nervous system effects.

Carcinogenicity: No carcinogenic effects registered.

Reproductive toxicity: This product has no known mammalian reproductive toxicity.

Medical conditions wich increase hazard to exposure: Avoid the use of epinephrine and other sympathomimetic amines.

12. ECOLOGICAL INFORMATION

Pollatant potential:

Persistence and degradability: If released to air, 1-butene is expected to be rapidly oxidized by both photochemically produced hydroxyl radicals and ozone. The half-life for these processes is 12 and 22 h respectively. Volatilization from soil and water surfaces is expected to be an important fate process. Biodegradation may occur in soil and water.

Mobility/bioaccumulative potential: The product has very high mobility in soil. The estimated bioconcentration factor (BCF) for the product suggests the potential for bioconcentration in aquatic organism is low.

Ecotoxicological effects: No ecotoxicity data available. Physical properties indicate that the product will rapidly volatilise from the aquatic environment.

13. DISPOSAL CONSIDERATIONS

Disposal methods (surplus): Due to high evaporation and commercial uses of the product, there is seldom necessity to dispose of them. End uses are usually combustion, addition as a feed stock in producing different compounds or dispersion in the atmosphere when used as aerosol propellants.

Waste:

Disposal: NP

Handling: NP

Provisions: Companies that recover, dispose, store, transport or handle waste should comply with local and/or national provisions in force on waste management.

14. TRANSPORT INFORMATION

Special precautions: Labelled as flammable gas. Transport in passenger aircrafts is forbidden and in passenger vessels is limited.

Additional Information:

LAND TRANSPORT:	
Proper shipping name :	BUTYLENES MIXTURE OR 1-BUTYLENE OR CIS-2-BUTYLENE OR TRANS-2BUTYLENE
UN Number :	1012
Hazard class :	Class 2. Classification code : 2F
Hazard identification number :	23
Packing group :	
Exempt amount :	
AIR TRANSPORT (ICAO/IATA) :	
Proper shipping name :	BUTYLENES MIXTURE OR 1-BUTYLENE OR CIS-2-BUTYLENE OR TRANS-2BUTYLENE
UN Number :	1012
Hazard class :	Class 2. Classification code : 2F
Packing group :	
CRE :	
Passenger and cargo aircraft :	
Cargo aircraft only :	
MARITIME TRANSPORT (IMDG/IMO) :	
Proper shipping name :	BUTYLENES MIXTURE OR 1-BUTYLENE OR CIS-2-BUTYLENE OR TRANS-2BUTYLENE
UN Number :	1012
Hazard class :	Class 2. Classification code : 2F
Packing group :	
Marine pollutant :	
Stowage and segregation :	

Ems :

15.REGULATORY INFORMATION

CLASIFICATION:	**LABELLING**
	Symbols: F+
	Phrases R: R12: Extremely flammable.
F+; R12	**Phrases S:** S9: Keep container in a well-ventilated place S16: Keep away from sources of ignition - No smoking. S33: Take precautionary measures against static discharges.

Other regulations: 1-Butene is listed in TSCA Inventory (EPA)

16. OTHER INFORMATION

Data Bases consulted

EINECS: European Inventory of Existing Commercial Substances.
RTECS: US Dept. of Health & Human Services.
HSDB: US National Library of Medicine.
CHRIS: US Dept. of Transportation.
TSCA: Toxic Substances Control Environmental Protection Agency.

R phrases show in the document:

Legislation consulted:

Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).
Dir. 67/548/EEC about classification, labelling and packaging of dangerous substances (including amendments and adaptations in force).
Dir. 1999/45/EC about classification, labelling and packaging of dangerous preparations (including amendments and adaptations in force).
Dir. 91/689/EEC dangerous waste; Dir. 91/156/EEC waste management.
Royal Decree 363/95: Regulation about notification of new substances and classification, packaging and labelling of dangerous substances.
Royal Decree 255/2003: Regulation about classification, packaging and labelling of dangerous preparations.
European Agreement concerning the international carriage of dangerous goods by road (ADR).
Regulation on the international transport of dangerous goods on the railway. (RID)
International maritime code of dangerous goods. (IMDG)
International Air Transport Association (IATA) regulation pertaining to air shipment.

Glossary:

CAS: Chemical Abstract Service
IARC: International Agency for Research on Cancer
TLV: Threshold Limit Value
TWA: Time Weighted Average
STEL: Short-term Exposure Limit
PEL: Permitted Exposure Level
REL: Recommended Exposure Level

TDL_0: Toxic Dose Lower
LDL_0: Lethal Dose Lower
LD_{50}: Lethal Dose (Medium)
LC_{50}: Lethal Concentration (Medium)
EC_{50}: Effective Concentration (Medium)
NP: Not pertinent
| : Changes from the last revision.

The information given in this document has been compiled based on the best existing information sources, latest available knowledge and according to the current requirements on classification, packaging and labelling of hazardous substances. It does not imply the information is exhaustive or accurate in all cases. It is the user's responsibility to determine the validity of the information contained in this Material Safety Data Sheet to apply depending on the case.