SAFETY DATA SHEET

Isobutanol
10250

Version / Revision	4.01	**Revision Date**	30-Nov-2020
Supersedes Version	4.00***	**Issuing date**	30-Nov-2020

SECTION 1: Identification

1.1. Product identifier

Identification of the substance/preparation **Isobutanol**

Chemical Name 2-Methylpropan-1-ol
CAS-No 78-83-1

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

Use of the Substance / Preparation Intermediate
solvent
Uses advised against None

1.3. Details of the supplier of the safety data sheet

Supplier

OQ Chemicals Corporation
15375 Memorial Drive
West Memorial Place I
Suite 300
Houston, TX 77079
USA
Phone +1 346 378 7300

Product Information

Product Stewardship
FAX: +49 (0)208 693 2053
email: sc.psq@oq.com

1.4. Emergency telephone number

Emergency telephone number NCEC +1 202 464 2554
available 24/7

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

This substance is classified in accordance with paragraph (d) of §1910.1200 (GHS-US classification).

Serious eye damage/eye irritation Category 1, H318
Target Organ Systemic Toxicant - Single exposure Category 3, H335; Category 3, H336
Flammable liquid Category 3, H226

OSHA Specified Hazards Not applicable.

2.2. Label elements

Labeling according to §1910.1200 (GHS-US labeling).

Hazard symbol(s)

Signal word **Danger**

Hazard statements
H226: Flammable liquid and vapor.
H318: Causes serious eye damage.
H335: May cause respiratory irritation.
H336: May cause drowsiness or dizziness.

Precautionary statements

Prevention
P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233: Keep container tightly closed.
P240: Ground and bond container and receiving equipment.
P241: Use explosion-proof electrical/ ventilating/ lighting equipment.
P242: Use non-sparking tools.
P243: Take precautionary measures against static discharge.
P261: Avoid breathing gas/mist/vapours.
P271: Use only outdoors or in a well ventilated area.
P280: Wear protective gloves/eye protection/face protection.***

Response
P303 + P361 + P353: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower.
P304 + P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310: Immediately call a POISON CENTER/doctor.

Storage
P403 + P235: Store in a well ventilated place. Keep cool.
P405: Store locked up.

Disposal
P501: Dispose of contents/container in accordance with local regulation.

2.3. Other hazards

Vapour is heavier than air and can travel considerable distance to a source of ignition and flashback
Vapours may form explosive mixture with air
Components of the product may be absorbed into the body by inhalation, ingestion and through the skin

SECTION 3: Composition / information on ingredients

3.1. Substances

Component	CAS-No	Concentration (%)
2-Methylpropan-1-ol	78-83-1	> 99,0

SECTION 4: First aid measures

4.1. Description of first aid measures

Inhalation
Keep at rest. Aerate with fresh air. When symptoms persist or in all cases of doubt seek medical advice.

Skin
Wash off immediately with soap and plenty of water. When symptoms persist or in all cases of doubt seek medical advice.

Eyes
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Remove contact lenses. Immediate medical attention is required.

Ingestion
Rinse mouth. Call a physician immediately. If conscious, drink plenty of water. Do not induce vomiting without medical advice.

4.2. Most important symptoms and effects, both acute and delayed

Main symptoms
headache, dizziness, drowsiness, abdominal pain, nausea, diarrhea, vomiting, unconsciousness.

Special hazard
Lung irritation, Pneumonia.

4.3. Indication of any immediate medical attention and special treatment needed

General advice
Remove contaminated, soaked clothing immediately and dispose of safely. If unconscious place in recovery position and seek medical advice. First aider needs to protect himself.

Treat symptomatically. If ingested, irrigate the stomach using activated charcoal. Chemical pneumonitis could follow respiratory exposure.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media
dry chemical, carbon dioxide (CO2), water spray, alcohol-resistant foam

Unsuitable Extinguishing Media
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Under conditions giving incomplete combustion, hazardous gases produced may consist of:
carbon monoxide (CO)
carbon dioxide (CO2)
Combustion gases of organic materials must in principle be graded as inhalation poisons
Vapour is heavier than air and can travel considerable distance to a source of ignition and flashback
Vapours may form explosive mixture with air

5.3. Advice for firefighters

Special protective equipment for firefighters
Fire fighter protection should include a self-contained breathing apparatus (NIOSH-approved or EN 133) and full fire-fighting turn out gear.

Precautions for firefighting
Cool containers / tanks with water spray. Dike and collect water used to fight fire. Keep people away from and upwind of fire. Do not allow run-off from fire fighting to enter drains or water courses. Foam should be applied in large quantities as it is broken down to some extent by the product.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

For non-emergency personnel: For personal protective equipment see section 8. Avoid contact with skin and eyes. Avoid breathing vapors or mists. Keep people away from and upwind of spill/leak. Ensure adequate ventilation, especially in confined areas. Keep away from heat and sources of ignition.
For emergency responders: Personal protection see section 8.

6.2. Environmental precautions

Prevent further leakage or spillage. Do not discharge product into the aquatic environment without pretreatment (biological treatment plant).

6.3. Methods and material for containment and cleaning up

Methods for containment
Stop the flow of material, if possible without risk. Dike spilled material, where this is possible.

Methods for cleaning up
Soak up with inert absorbent material (e.g. universal binder). Keep in suitable, closed containers for disposal. If liquid has been spilt in large quantities clean up promptly by scoop or vacuum. Dispose of in accordance with local regulations. Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapours).

6.4. Reference to other sections

For personal protective equipment see section 8.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Advice on safe handling
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product. Provide sufficient air exchange and/or exhaust in work rooms.

Hygiene measures
When using, do not eat, drink or smoke. Take off all contaminated clothing immediately. Wash hands before breaks and immediately after handling the product.

Advice on the protection of the environment
See Section 8: Environmental exposure controls.

Incompatible products
strong oxidizing agents

7.2. Conditions for safe storage, including any incompatibilities

Advice on protection against fire and explosion
Keep away from sources of ignition - No smoking. Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapours). In case of fire, emergency cooling with water spray should be available. Ground and bond containers when transferring material. Vapour is heavier than air and can travel considerable distance to a source of ignition and flashback. Vapours may form explosive mixture with air.

Technical measures/Storage conditions
Keep containers tightly closed in a cool, well-ventilated place. Handle and open container with care.

Suitable material
stainless steel, mild steel

Unsuitable material
Aluminium, Attacks some forms of plastic and rubber

SECTION 8: Exposure controls / personal protection

8.1. Control parameters

Exposure limits United States of America

US ACGIH

Component	TWA (mg/m³)	TWA (ppm)	STEL (mg/m³)	STEL (ppm)
2-Methylpropan-1-ol CAS: 78-83-1		50		

US OSHA Z-1

Component	Ceiling (mg/m³)	Ceiling (ppm)	PEL (mg/m³)	PEL (ppm)	Skin Designation
2-Methylpropan-1-ol CAS: 78-83-1			300	100	

Note
For details and further information please refer to the original regulation.

8.2. Exposure controls

Appropriate Engineering controls
General or dilution ventilation is frequently insufficient as the sole means of controlling employee exposure. Local ventilation is usually preferred. Explosion-proof equipment (for example fans, switches, and grounded ducts) should be used in mechanical ventilation systems.

Individual protection measures, such as personal protective equipment

General industrial hygiene practice
Avoid contact with skin, eyes and clothing. Do not breathe vapours or spray mist. Ensure that eyewash stations and safety showers are close to the workstation location.

Hygiene measures
When using, do not eat, drink or smoke. Take off all contaminated clothing immediately. Wash hands before breaks and immediately after handling the product.

Eye protection
Tightly fitting safety goggles. In addition to goggles, wear a face shield if there is a reasonable chance for splash to the face.

Hand protection
Wear protective gloves. Recommendations are listed below. Other protective material may be used, depending on the situation, if adequate degradation and permeation data is available. If other chemicals are used in conjunction with this chemical, material selection should be based on protection for all chemicals present.

Suitable material	butyl-rubber
Evaluation	according to EN 374: level 6
Glove thickness	approx 0,3 mm
Break through time	> 480 min
Suitable material	nitrile rubber

Evaluation	according to EN 374: level 6
Glove thickness	approx 0,55 mm
Break through time	> 480 min

Skin and body protection
Impervious clothing. Wear face-shield and protective suit for abnormal processing problems.

Respiratory protection
Respirator with filter for organic vapour. Use the indicated respiratory protection if the occupational exposure limit is exceeded and/or in case of product release (vapor or mist). Equipment should conform to NIOSH.***

Environmental exposure controls
If possible use in closed systems. If leakage can not be prevented, the substance needs to be suck off at the emersion point, if possible without danger. Observe the exposure limits, clean exhaust air if needed. If recycling is not practicable, dispose of in compliance with local regulations. Inform the responsible authorities in case of leakage into the atmosphere, or of entry into waterways, soil or drains.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	liquid
Colour	colourless
Odour	alcoholic
Odour threshold	123 mg/m³
pH	neutral
Melting point/range	< -130 °F (< -90 °C) (Pour point) < -4 °F (< -20 °C) (Freezing Point)***
Method	DIN ISO 3016
Boiling point/range	226,4 °F (108 °C) @ 1 atm (101,3 kPa)
Method	OECD 103
Flash point	87,8 °F (31 °C) @ 1 atm (101,3 kPa)***
Method	ISO 2719
Evaporation rate	No data available
Flammability (solid, gas)	Does not apply, the substance is a liquid
Lower explosion limit	1,2 Vol %
Upper explosion limit	10,9 Vol %

Vapour pressure

Values [hPa]	Values [kPa]	Values [atm]	@ °C	@ °F	Method
10,5***	1,05***	0,010***	20	68	OECD 104***
40***	4***	0,039***	41***	105,8***	OECD 104***

Vapour density 2,6 (Air = 1) @ 20 °C (68 °F)

Relative density

Values	@ °C	@ °F	Method
0,802	20	68	DIN 51757

Solubility	70 g/l @ 20 °C (68 °F), in water, OECD 105
log Pow	1 @ pH 7 @ 25°C (77°F) (measured) OECD 117
Autoignition temperature	752 °F (400 °C) @ 1007 hPa***

Method	DIN 51794
Decomposition temperature	No data available
Viscosity	4,041 mPa*s @ 68 °F (20 °C)
Method	dynamic, DIN 51562, ASTM D445

9.2. Other information

Molecular weight	74,12
Molecular formula	C4 H10 O
log Koc	0,47 calculated
Oxidizing properties	Does not apply, substance is not oxidising. There are no chemical groups associated with oxidizing properties
Refractive Index	1,396 @ 68 °F (20 °C)
Explosive properties	Does not apply, substance is not explosive. There are no chemical groups associated with explosive properties
Surface tension	69,7 mN/m (1 g/l @ 20°C (68°F)), OECD 115

SECTION 10: Stability and Reactivity

10.1. Reactivity

The reactivity of the product corresponds to the typical reactivity shown by the substance group as described in any text book on organic chemistry.

10.2. Chemical stability

Stable under recommended storage conditions.

10.3. Possibility of hazardous reactions

Vapours may form explosive mixture with air.

10.4. Conditions to avoid

Avoid contact with heat, sparks, open flame and static discharge. Avoid any source of ignition.

10.5. Incompatible materials

strong oxidizing agents.

10.6. Hazardous decomposition products

No decomposition if stored and applied as directed.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Likely routes of exposure Ingestion, Inhalation, Eye contact, Skin contact

2-Methylpropan-1-ol, CAS: 78-83-1
Main symptoms
headache, dizziness, drowsiness, abdominal pain, nausea, diarrhoea, vomiting, unconsciousness.
Target Organ Systemic Toxicant - Single exposure
The available data lead to the classification given in section 2
Target Organ Systemic Toxicant - Repeated exposure
Based on available data, the classification criteria are not met for:
STOT RE

Acute toxicity				
2-Methylpropan-1-ol (78-83-1)				
Routes of Exposure	Endpoint	Values	Species	Method
Oral	LD50	> 2830 mg/kg	rat, male	OECD 401
Oral	LD50	3350 mg/kg	rat, female	OECD 401
Dermal	LD50	> 2000 mg/kg	rabbit male female	OECD 402
Inhalative	LC50	> 18,18 mg/l (6 h)	rat, male/female	40 CFR 798.1150

2-Methylpropan-1-ol, CAS: 78-83-1
Assessment
Based on available data, the classification criteria are not met for:
Acute oral toxicity
Acute dermal toxicity
Acute inhalation toxicity

Irritation and corrosion				
2-Methylpropan-1-ol (78-83-1)				
Target Organ Effects	Species	Result	Method	
Skin	rabbit	Mild skin irritation***	OECD 404	Weight of evidence in vivo 4h***
Eyes	rabbit	corrosive***	OECD 405	in vivo 24h***
Respiratory tract***	mouse male***	RD50: 1818 ppm***		5 min***

2-Methylpropan-1-ol, CAS: 78-83-1
Assessment
The available data lead to the classification given in section 2***

Sensitization				
2-Methylpropan-1-ol (78-83-1)				
Target Organ Effects	Species	Evaluation	Method	
Skin***		not sensitizing***	QSAR***	Weight of evidence***

2-Methylpropan-1-ol, CAS: 78-83-1
Assessment
Based on available data, the classification criteria are not met for:
Skin sensitization

For respiratory sensitization, no data are available

Subacute, subchronic and prolonged toxicity				
2-Methylpropan-1-ol (78-83-1)				
Type	Dose	Species	Method	
Subchronic toxicity	NOEL: > 1450 mg/m³/d (90 d)***	rat, male/female	OECD 408	Oral
Subchronic toxicity	NOAEL: >=7,5 mg/l	rat rat, male/female***	EPA OPPTS 870.3800	Inhalation
Subchronic toxicity***	NOEL: ~ 3 mg/m³/d (102 d)***	rat, male/female***	82-7 F***	Inhalation***

2-Methylpropan-1-ol, CAS: 78-83-1
Assessment
Based on available data, the classification criteria are not met for:
STOT RE

Carcinogenicity, Mutagenicity, Reproductive toxicity					
2-Methylpropan-1-ol (78-83-1)					
Type	Dose	Species	Evaluation	Method	
Mutagenicity		Salmonella typhimurium	negative	OECD 471 (Ames)	In vitro study***
Mutagenicity		V79 cells, Chinese hamster	negative	HPRT	In vitro study***
Mutagenicity		V79 cells, Chinese hamster	negative	Chromosomal Aberration	in vitro micronucleus study
Mutagenicity		mouse male/female***	negative	OECD 474	Oral in vivo
Carcinogenicity			negative	QSAR	
Reproductive toxicity	NOAEL >= 7,5 mg/l	rat, parental		EPA OPPTS 870.3800	Inhalation
Reproductive toxicity	NOAEL >= 7,5 mg/l	rat, 1. Generation, male/female rat 2. Generation, male/female***		EPA OPPTS 870.3800	Inhalation
Developmental Toxicity	NOAEL 10 mg/l	rat		OECD 414, Inhalative	Maternal toxicity***
Developmental Toxicity	NOAEL 2,5 mg/l	rabbit		OECD 414, Inhalative	Maternal toxicity
Developmental Toxicity	NOAEL > 10 mg/l	rabbit rat		OECD 414, Inhalative	Teratogenicity
Developmental Toxicity	NOAEL > 10 mg/l	rabbit rat		OECD 414, Inhalative	Fetal toxicity
Mutagenicity***		human lung carcinoma epithelial A549***	negative***	Comet Assay***	In vitro study***

2-Methylpropan-1-ol, CAS: 78-83-1
CMR Classification
The available data on CMR properties are summarized in the table above. They do not indicate a classification into categories 1A or 1B
Evaluation
In vitro tests did not show mutagenic effects
Did not show reprotoxic or mutagenic effects in animal experiments
No developmental effects in the absence of maternal toxicity
No indication for a carcinogenic potential

2-Methylpropan-1-ol, CAS: 78-83-1
Aspiration toxicity
Based on the viscosity a potential aspiration hazard cannot be excluded
Other adverse effects
Components of the product may be absorbed into the body by inhalation, ingestion and through the skin.
Note
Handle in accordance with good industrial hygiene and safety practice. Further details on substance data can be found in the registration dossier under the following link:
http://echa.europa.eu/information-on-chemicals/registered-substances.

SECTION 12: Ecological information

12.1. Toxicity

Acute aquatic toxicity			
2-Methylpropan-1-ol (78-83-1)			
Species	Exposure time	Dose	Method
Pimephales promelas (fathead minnow)	96h	LC50: 1430 mg/l	
Daphnia pulex (Water flea)	48h	EC50: 1100 mg/l	ASTM D4229***
Pseudokirchneriella subcapitata	72h	EC50: 1799 mg/l (Growth rate)	OECD 201
Pseudokirchneriella subcapitata	72h	EC50: 632 mg/l (Biomass)	OECD 201
Bacteria / Sewage	16 h	IC50: > 1000 mg/l (Growth inhibition)	
Pseudomonas putida***	TGK: 280 mg/l***	Cell multiplication inhibition test***	

Long term toxicity				
2-Methylpropan-1-ol (78-83-1)				
Type	Species	Dose	Method	
Reproductive toxicity	Daphnia magna (Water flea)	NOEC: 20 mg/l (21d)		
Aquatic toxicity	Pseudokirchneriella subcapitata	NOEC: 53 mg/l (3d) Biomass	OECD 201	

12.2. Persistence and degradability

2-Methylpropan-1-ol, CAS: 78-83-1
Biodegradation
70-80 % (28 d), Industrial sewage filtrate, aerobic, OECD 301 D.***

Abiotic Degradation		
2-Methylpropan-1-ol (78-83-1)		
Type	Result	Method
Hydrolysis	No data available	
Photolysis	Half-life (DT50): 56 h***	calculated SRC AOP v1.92

12.3. Bioaccumulative potential

2-Methylpropan-1-ol (78-83-1)		
Type	Result	Method
log Pow	1 @ pH 7 @ 25°C (77°F)	measured, OECD 117
BCF	not expected***	

12.4. Mobility in soil

2-Methylpropan-1-ol (78-83-1)		
Type	Result	Method
Surface tension	69,7 mN/m (1 g/l @ 20°C (68°F))	OECD 115
Adsorption/Desorption	log Koc: 0,47	calculated SRC PCKOCWIN v2.00
Distribution to environmental compartments	no data available	

12.5. Results of PBT and vPvB assessment

2-Methylpropan-1-ol, CAS: 78-83-1
PBT and vPvB assessment
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT), nor very persistent nor very bioaccumulating (vPvB)

12.6. Other adverse effects

2-Methylpropan-1-ol, CAS: 78-83-1
No data available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Product Information
Disposal required in compliance with all waste management related state and local regulations. The choice of the appropriate method of disposal depends on the product composition by the time of disposal as well as the local

statutes and possibilities for disposal.

Uncleaned empty packaging
Contaminated packaging should be emptied as far as possible and after appropriate cleansing may be taken for reuse.

SECTION 14: Transport information

D.O.T. (49CFR)

14.1. UN number	UN 1212
14.2. UN proper shipping name	Isobutanol
14.3. Transport hazard class(es)	3
14.4. Packing group	III
14.5. Environmental hazards	no
14.6. Special precautions for user	
Reportable Quantity (RQ)	5000 lb/ 2270 kg (Isobutyl alcohol)
Emergency Response Guide	129

ICAO-TI / IATA-DGR

14.1. UN number	UN 1212
14.2. UN proper shipping name	Isobutanol
14.3. Transport hazard class(es)	3
14.4. Packing group	III
14.5. Environmental hazards	no
14.6. Special precautions for user	no data available

IMDG

14.1. UN number	UN 1212
14.2. UN proper shipping name	Isobutanol
14.3. Transport hazard class(es)	3
14.4. Packing group	III
14.5. Environmental hazards	no
14.6. Special precautions for user	
EmS	F-E, S-D

14.7. Transport in bulk according to Annex II of MARPOL and the IBC Code

Product name	Isobutyl alcohol

Ship type	3
Pollution category	Z

SECTION 15: Regulatory information

Federal and State Regulations

Components of the product are listed in the quoted regulations. For details please refer to the regulations directly. This list is not exhaustive, please check for other applicable regulations.

Federal Regulations

This product is listed on the TSCA inventory

2-Methylpropan-1-ol, CAS: 78-83-1

CERCLA Hazardous Substance

CERCLA RQ	5000 LBS

State Regulations

2-Methylpropan-1-ol, CAS: 78-83-1

- CA Hazardous Substances (Director's) List
- IL Chemical Safety Act
- MA Hazardous Substances List
- MA RTK List
- MN Hazardous Substances List
- NY RTK List
- PA RTK List
- RI RTK List

International Inventories

2-Methylpropan-1-ol, CAS: 78-83-1

- AICS (AU)
- DSL (CA)
- IECSC (CN)
- EC-No. 2011480 (EU)
- ENCS (2)-3049 (JP)
- ISHL (2)-3049 (JP)
- KECI KE-24894 (KR)
- INSQ (MX)
- PICCS (PH)
- TSCA (US)
- NZIoC (NZ)
- TCSI (TW)

SECTION 16: Other information

Revision Date 30-Nov-2020

Issuing date 30-Nov-2020

Hazard Rating Systems

NFPA (National Fire Protection Association)

Health Hazard	2
Fire Hazard	3
Reactivity	0

HMIS (Hazardous Material Information System)

Health Hazard	2
Flammability	3
Physical Hazard	0

Training advice
For effective first-aid, special training / education is needed.

Sources of key data used to compile the datasheet
Information contained in this safety data sheet is based on OQ owned data and public sources deemed valid or acceptable. The absence of data elements required by OSHA, ANSI or Annex II, Regulation 1907/2006/EC indicates, that no data meeting these requirements is available.

Further information for the safety data sheet
Changes against the previous version are marked by ***. Observe national and local legal requirements. For more information, other material safety data sheets or technical data sheets please consult the OQ homepage (www.chemicals.oq.com).
The use of a comma in section 3 and section 7 to 12 is the same as a period.

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End of Safety Data Sheet