

SECTION 1: Identification

1.1. Identification

Product form : Substance
 Substance name : BIOPURE nC4-OL
 Chemical name : n-butanol
 CAS No : 71-36-3
 Formula : C4 H10 O
 Other means of identification : 1-butanol

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

Use of the substance/mixture : Industrial use

1.3. Details of the supplier of the safety data sheet

Manufacturer
 Central MN Renewables, LLC. A Subsidiary of Green Biologics Ltd.
 17936 Heron Road
 Little Falls, MN 56345 - United States
 T 320-632-1614

Supplier
 Green Biologics Inc.
 10338 Stony Run Lane
 Ashland, VA 23005
 T: 1-804-368-6136

1.4. Emergency telephone number

Emergency number : (800) 424-9300 (CCN# 677246) Outside USA and Canada: +1 703-741-5970

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Flam. Liq. 3	H226 -	Flammable liquid and vapor
Acute Tox. 4 (Oral)	H302 -	Harmful if swallowed
Skin Irrit. 2	H315 -	Causes skin irritation
Eye Dam. 1	H318 -	Causes serious eye damage
STOT SE 3	H335 -	May cause respiratory irritation
STOT SE 3	H336 -	May cause drowsiness or dizziness

Full text of H statements : see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :



Signal word (GHS-US) : Danger

Hazard statements (GHS-US) : H226 - Flammable liquid and vapor
 H302 - Harmful if swallowed
 H315 - Causes skin irritation
 H318 - Causes serious eye damage
 H335 - May cause respiratory irritation
 H336 - May cause drowsiness or dizziness

Precautionary statements (GHS-US) : P210 - Keep away from heat, sparks, open flames. - No smoking
 P233 - Keep container tightly closed
 P240 - Ground/Bond container and receiving equipment
 P241 - Use explosion-proof electrical/ventilating/lighting/... equipment
 P242 - Use only non-sparking tools
 P243 - Take precautionary measures against static discharge
 P261 - Avoid breathing fume, mist, spray, vapors

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P264 - Wash hands thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301+P312 - If swallowed: Call a doctor if you feel unwell
P302+P352 - If on skin: Wash with plenty of water
P303+P361+P353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/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
P312 - Call a doctor if you feel unwell
P330 - Rinse mouth
P332+P313 - If skin irritation occurs: Get medical advice/attention
P362+P364 - Take off contaminated clothing and wash it before reuse
P370+P378 - In case of fire: Use media other than water to extinguish
P403+P233 - Store in a well-ventilated place. Keep container tightly closed
P403+P235 - Store in a well-ventilated place. Keep cool
P405 - Store locked up
P501 - Dispose of contents/container to hazardous or special waste collection point, in accordance with local, regional, national and/or international regulation

2.3. Other hazards

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substance

Substance type : Mono-constituent
Name : BIOPURE nC4-OL
CAS No : 71-36-3

Name	Product identifier	%	GHS-US classification
n-butanol	(CAS No) 71-36-3	>= 99.8	Flam. Liq. 3, H226 Acute Tox. 4 (Oral), H302 Skin Irrit. 2, H315 Eye Dam. 1, H318 STOT SE 3, H335 STOT SE 3, H336

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Call a poison center/doctor/physician if you feel unwell. If you feel unwell, seek medical advice (show the label where possible).
First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. Call a poison center/doctor/physician if you feel unwell.
First-aid measures after skin contact : If skin irritation occurs: Get medical advice/attention. Wash skin with plenty of water.
First-aid measures after eye contact : Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician immediately.
First-aid measures after ingestion : Rinse mouth. Call a poison center/doctor/physician if you feel unwell.

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

Symptoms/injuries : May cause drowsiness or dizziness.
Symptoms/injuries after inhalation : May cause respiratory irritation.
Symptoms/injuries after skin contact : Irritation.
Symptoms/injuries after eye contact : Serious damage to eyes.
Symptoms/injuries after ingestion : May be harmful if swallowed.

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

Not applicable.

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SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Water spray. Dry powder. Carbon dioxide. Alcohol-resistant foam.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Flammable liquid and vapor.

Explosion hazard : Under conditions giving incomplete combustion, hazardous gases produced may consist of: carbon monoxide (CO), carbon dioxide (CO₂). Combustion of gases of organic materials must in principle be graded as inhalation poisons. Vapor is heavier than air and can travel long distances to a source of ignition and flashback. Vapors may form explosive mixtures with air. Prevent buildup of vapors or gases to explosive concentrations.

Reactivity : Heating may cause a fire.

5.3. Advice for firefighters

Protection during firefighting : Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Emergency procedures : Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid contact with skin and eyes. No open flames, no sparks, and no smoking. Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up : Use only explosion-free, grounded electrical equipment. In case of large spillages: Soak up spills with inert solids, such as clay or diatomaceous earth as soon as possible. Shovel or sweep up and put in a closed container for disposal. Small quantities of liquid spill: take up in non-combustible absorbent material and shovel into container for disposal. Notify authorities if product enters sewers or public waters.

Other information : Dispose of materials or solid residues at an authorized site.

6.4. Reference to other sections

For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Use only outdoors or in a well-ventilated area. Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid contact with skin and eyes. Wear personal protective equipment. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Ground/bond container and receiving equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Flammable vapors may accumulate in the container. Use explosion-proof equipment.

Hygiene measures : Wash contaminated clothing before reuse. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Ground/bond container and receiving equipment.

Storage conditions : Store locked up. Store in a well-ventilated place. Keep container tightly closed. Keep cool.

Packaging materials : mild steel. stainless steel.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

n-butanol (71-36-3)		
ACGIH	ACGIH TWA (ppm)	20 ppm

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n-butanol (71-36-3)		
OSHA	OSHA PEL (TWA) (mg/m ³)	300 mg/m ³
OSHA	OSHA PEL (TWA) (ppm)	100 ppm

8.2. Exposure controls

Appropriate engineering controls	: Use only explosion-proof equipment. Use non-sparking handtools. Ensure good ventilation of the work station.
Hand protection	: Protective gloves.
Eye protection	: Chemical goggles or safety glasses. Eye protection, including both chemical splash goggles and face shield, must be worn when possibility exists for eye contact due to spraying liquid or airborne particles.
Skin and body protection	: Wear suitable protective clothing.
Respiratory protection	: In case of insufficient ventilation, wear suitable respiratory equipment.
Environmental exposure controls	: Avoid release to the environment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Liquid
Color	: clear
Odor	: alcohol-like
Odor threshold	: 0.83 ppm
pH	: No data available
Melting point	: Not applicable
Freezing point	: -89 °C
Boiling point	: 118 °C
Flash point	: 36 °C (Tag Open Cup)
Relative evaporation rate (butyl acetate=1)	: 0.5
Flammability (solid, gas)	: No data available
Explosion limits	: 1.4 - 11.3 vol %
Explosive properties	: No data available
Oxidizing properties	: No data available
Vapor pressure	: 7.3 mbar
Relative density	: 0.81
Relative vapor density at 20 °C	: No data available
Molecular mass	: 74.12 g/mol
Solubility	: Moderately soluble in water.
Log Pow	: 0.88
Auto-ignition temperature	: 343 °C
Decomposition temperature	: No data available
Viscosity	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: 3 mPa.s

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

Heating may cause a fire.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

No dangerous reactions known under normal conditions of use.

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10.4. Conditions to avoid

No flames, no sparks. Eliminate all sources of ignition.

10.5. Incompatible materials

Reducing agents. Oxidizing agents and acids. Acid chlorides.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. On combustion, forms: carbon oxides (CO and CO₂).

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Oral: Harmful if swallowed.

BIOPURE nC4-OL (71-36-3)	
ATE US (oral)	500.000 mg/kg body weight
n-butanol (71-36-3)	
LD50 oral rat	700 mg/kg
LD50 dermal rabbit	3402 mg/kg
LC50 inhalation rat (ppm)	> 8000 ppm/4h
ATE US (oral)	700.000 mg/kg body weight
ATE US (dermal)	3402.000 mg/kg body weight

Skin corrosion/irritation : Causes skin irritation.
Serious eye damage/irritation : Causes serious eye damage.
Respiratory or skin sensitization : Not classified
Germ cell mutagenicity : Not classified
Carcinogenicity : Not classified
Reproductive toxicity : Not classified
Specific target organ toxicity – single exposure : May cause respiratory irritation. May cause drowsiness or dizziness.
Specific target organ toxicity – repeated exposure : Not classified
Aspiration hazard : Not classified
Symptoms/injuries after inhalation : May cause respiratory irritation.
Symptoms/injuries after skin contact : Irritation.
Symptoms/injuries after eye contact : Serious damage to eyes.
Symptoms/injuries after ingestion : May be harmful if swallowed.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : The product is not considered harmful to aquatic organisms or to cause long-term adverse effects in the environment.

n-butanol (71-36-3)	
LC50 fish 1	1730 - 1910 mg/l (Exposure time: 96 h - Species: Pimephales promelas [static])
EC50 Daphnia 1	1983 mg/l (Exposure time: 48 h - Species: Daphnia magna)
LC50 fish 2	1740 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])
EC50 Daphnia 2	1897 - 2072 mg/l (Exposure time: 48 h - Species: Daphnia magna [Static])

12.2. Persistence and degradability

BIOPURE nC4-OL (71-36-3)	
Persistence and degradability	Not established.

12.3. Bioaccumulative potential

BIOPURE nC4-OL (71-36-3)	
Log Pow	0.88
Bioaccumulative potential	Not established.

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n-butanol (71-36-3)	
BCF fish 1	0.64
Log Pow	0.785 (at 25 °C)

12.4. Mobility in soil

BIOPURE nC4-OL (71-36-3)	
Ecology - soil	Not established.

12.5. Other adverse effects

Effect on global warming : No known effects from this product.
Not established

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods : Dispose of waste material in accordance with applicable federal, state, and local waste management regulations. Do not allow into drains or water courses.

Waste disposal recommendations : Dispose in a safe manner in accordance with local/national regulations. Contaminated packaging and recommended cleaning: Packaging: Completely emptied packings can be recycled.

Additional information : Flammable vapors may accumulate in the container.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN1120 Butanols, 3, III

UN-No.(DOT) : UN1120

Proper Shipping Name (DOT) : Butanols

Class (DOT) : 3 - Class 3 - Flammable and combustible liquid 49 CFR 173.120

Hazard labels (DOT) : 3 - Flammable liquid



Packing group (DOT) : III - Minor Danger

DOT Packaging Non Bulk (49 CFR 173.xxx) : 203

DOT Packaging Bulk (49 CFR 173.xxx) : 242

DOT Special Provisions (49 CFR 172.102) : B1 - If the material has a flash point at or above 38 C (100 F) and below 93 C (200 F), then the bulk packaging requirements of 173.241 of this subchapter are applicable. If the material has a flash point of less than 38 C (100 F), then the bulk packaging requirements of 173.242 of this subchapter are applicable
IB3 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1 and 31HA2, 31HB2, 31HN2, 31HD2 and 31HH2). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized, except for UN2672 (also see Special Provision IP8 in Table 2 for UN2672)
T2 - 1.5 178.274(d)(2) Normal..... 178.275(d)(3)
TP1 - The maximum degree of filling must not exceed the degree of filling determined by the following: Degree of filling = $97 / 1 + a (tr - tf)$ Where: tr is the maximum mean bulk temperature during transport, and tf is the temperature in degrees celsius of the liquid during filling

DOT Packaging Exceptions (49 CFR 173.xxx) : 150

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 60 L

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 220 L

DOT Vessel Stowage Location : A - The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel

Emergency Response Guide (ERG) Number : 129

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Other information : No supplementary information available.

TDG

No additional information available

Transport by sea

UN-No. (IMDG) : 1120
Proper Shipping Name (IMDG) : BUTANOLS
Class (IMDG) : 3 - Flammable liquids
Packing group (IMDG) : III - substances presenting low danger

Air transport

UN-No. (IATA) : 1120
Proper Shipping Name (IATA) : Butanols
Class (IATA) : 3 - Flammable Liquids
Packing group (IATA) : III - Minor Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

Chemical(s) subject to the reporting requirements of Section 313 or Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372.

1-Butanol	CAS No 71-36-3	>= 99.8%
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n-butanol (71-36-3)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

CERCLA RQ	5000 lb
SARA Section 313 - Emission Reporting	1.0 %

15.2. International regulations

National regulations

BIOPURE nC4-OL (71-36-3)

All chemical substances in this product are listed in the EPA (Environment Protection Agency) TSCA (Toxic Substances Control Act) Inventory

n-butanol (71-36-3)

Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
Listed on the Japanese ISHL (Industrial Safety and Health Law)
Listed on the Korean ECL (Existing Chemicals List)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Listed on the Canadian IDL (Ingredient Disclosure List)
Listed on INSQ (Mexican National Inventory of Chemical Substances)
Listed on CICR (Turkish Inventory and Control of Chemicals)

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

n-butanol (71-36-3)

U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

SECTION 16: Other information

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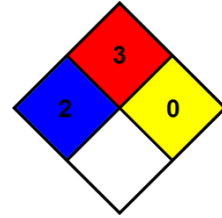
Full text of H-phrases:

H226	Flammable liquid and vapor
H302	Harmful if swallowed
H315	Causes skin irritation
H318	Causes serious eye damage
H335	May cause respiratory irritation
H336	May cause drowsiness or dizziness

NFPA health hazard : 2 - Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical attention is given.

NFPA fire hazard : 3 - Liquids and solids that can be ignited under almost all ambient conditions.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health : 2 Moderate Hazard - Temporary or minor injury may occur

Flammability : 3 Serious Hazard - Materials capable of ignition under almost all normal temperature conditions. Includes flammable liquids with flash points below 73 F and boiling points above 100 F. as well as liquids with flash points between 73 F and 100 F. (Classes IB & IC)

Physical : 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

Personal protection : C

C - Safety glasses, Gloves, Synthetic apron

SDS GHS US CUSTOM BLUE

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product