SAFETY DATA SHEET

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

1.1 Product identifiers

Product name: 2,3-Butanedione

Product Number: B85307

Brand: Aldrich

CAS-No.: 431-03-8

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 liquids (Category 2), H225

Acute toxicity, Oral (Category 4), H302

Acute toxicity, Inhalation (Category 3), H331

Skin irritation (Category 2), H315

Serious eye damage (Category 1), H318

Skin sensitization (Category 1), H317

Specific target organ toxicity - repeated exposure, Inhalation (Category 2), Respiratory system, H373

Short-term (acute) aquatic hazard (Category 3), H402

For the full text of the H-Statements mentioned in this Section, see Section 16.
2.2 **GHS Label elements, including precautionary statements**

**Pictogram**

![Pictogram](image)

**Signal Word**

Danger

**Hazard statement(s)**

- H225 Highly flammable liquid and vapor.
- H302 Harmful if swallowed.
- H315 Causes skin irritation.
- H317 May cause an allergic skin reaction.
- H318 Causes serious eye damage.
- H331 Toxic if inhaled.
- H373 May cause damage to organs (Respiratory system) through prolonged or repeated exposure if inhaled.
- H402 Harmful to aquatic life.

**Precautionary statement(s)**

- P210 Keep away from heat/ sparks/ open flames/ hot surfaces. 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.
- P260 Do not breathe mist or vapors.
- P264 Wash skin thoroughly after handling.
- P270 Do not eat, drink or smoke when using this product.
- P271 Use only outdoors or in a well-ventilated area.
- P272 Contaminated work clothing must not be allowed out of the workplace.
- P273 Avoid release to the environment.
- P280 Wear protective gloves/ eye protection/ face protection.
- P301 + P312 + P330 IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.
- P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
- P304 + P340 + P311 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor.
- P305 + P351 + P338 + P310 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.
- P314 Get medical advice/ attention if you feel unwell.
- P333 + P313 If skin irritation or rash occurs: Get medical advice/ attention.
- P362 Take off contaminated clothing and wash before reuse.
- P370 + P378 In case of fire: Use dry sand, dry chemical or alcohol-resistant foam 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 an approved waste disposal plant.
2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Stench.

SECTION 3: Composition/information on ingredients

3.1 Substances

<table>
<thead>
<tr>
<th>Synonyms</th>
<th>Biacetyl</th>
<th>Diacetyl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formula</td>
<td>C₄H₆O₂</td>
<td></td>
</tr>
<tr>
<td>Molecular weight</td>
<td>86.09 g/mol</td>
<td></td>
</tr>
<tr>
<td>CAS-No.</td>
<td>431-03-8</td>
<td></td>
</tr>
<tr>
<td>EC-No.</td>
<td>207-069-8</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>butanedione</td>
<td>Flam. Liq. 2; Acute Tox. 4; Acute Tox. 3; Skin Irrit. 2; Eye Dam. 1; Skin Sens. 1; STOT RE 2; Aquatic Acute 3; H225, H302, H331, H315, H318, H317, H373, H402</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

No data available

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
Carbon dioxide (CO2) Foam Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.
5.2 Special hazards arising from the substance or mixture
Carbon oxides
Combustible.

5.3 Advice for firefighters
No data available

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
For personal protection see section 8.

6.2 Environmental precautions
No data available

6.3 Methods and materials for containment and cleaning up
No data available

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
Use with local exhaust ventilation. Avoid contact with skin and eyes. Avoid inhalation of vapor or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
No data available

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

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>butanedione</td>
<td>431-03-8</td>
<td>TWA</td>
<td>0.01 ppm</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
<td></td>
<td>Not classifiable as a human carcinogen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>STEL</td>
<td>0.02 ppm</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Not classifiable as a human carcinogen</td>
</tr>
</tbody>
</table>
8.2 Exposure controls

Appropriate engineering controls
This compound should be handled in a closed system. All operations should avoid accidental contact.

Personal protective equipment

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: butyl-rubber
Minimum layer thickness: 0.7 mm
Break through time: 240 min
Material tested:Butoject® (KCL 898)

Body Protection
Long sleeved clothing, Preventive skin protection

Respiratory protection
Recommended Filter type: Filter A (acc. to DIN 3181) for vapours of organic compounds
The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.
required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Prevent product from entering drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- a) Appearance
  - Form: clear, liquid
  - Color: dark yellow

- b) Odor
  - Stench.

- c) Odor Threshold
  - 0.0086 ppm

- d) pH
  - 3.2

- e) Melting point/freezing point
  - Melting point: -2 °C (28 °F)

- f) Initial boiling point and boiling range
  - 88 °C 190 °F - lit.

- g) Flash point
  - 7 °C (45 °F) - closed cup

- h) Evaporation rate
  - No data available
9.2 **Other safety information**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative vapor density</td>
<td>3.45</td>
</tr>
</tbody>
</table>

**SECTION 10: Stability and reactivity**

10.1 **Reactivity**

No data available

10.2 **Chemical stability**

No data available

10.3 **Possibility of hazardous reactions**

Violent reactions possible with:
- alkalines
- Acids
- various plastics
Risk of ignition or formation of inflammable gases or vapours with:
- strong oxidising agents

10.4 **Conditions to avoid**

No data available

10.5 **Incompatible materials**

No data available
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
LD50 Oral - Rat - 1,580 mg/kg
Behavioral: Convulsions or effect on seizure threshold.
(RTECS)
LC50 Inhalation - Rat - 4 h - 2.25 - 5.2 mg/l - vapor
Remarks: (External MSDS)
Symptoms: Possible damages: Irritation symptoms in the respiratory tract.
LD50 Dermal - Rabbit - > 5,000 mg/kg
Remarks: (RTECS)

Skin corrosion/irritation
Skin - Rabbit
Result: Irritations
Remarks: (External MSDS)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Severe eye irritation
Remarks: (External MSDS)

Respiratory or skin sensitization
May cause allergic skin reaction.

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
Inhalation - May cause damage to organs through prolonged or repeated exposure.
- Respiratory system

Aspiration hazard
No data available
11.2 Additional Information

RTECS: EK2625000
Nausea, Headache, Vomiting

For additional studies related to this product, review OSHA literature on Diacetyl and flavorings (www.OSHA.gov), the OSHA NEP for Microwave Popcorn Processing Plants, NIOSH publication 2004-110d, and other NIOSH literature regarding flavorings (www.cdc.gov/NIOSH). Animals exposed to diacetyl and other related diacetyl substitutes experienced damage to the nose and upper airways, including severe damage to cells lining the respiratory tract. NIOSH has reported that employees exposed to butter flavorings containing diacetyl are at risk of developing occupational lung diseases and that in one instance, similar illnesses have been found among employees producing butter and vanilla flavorings containing diacetyl.

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

After absorption of toxic quantities:

Headache
Nausea

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish LC50 - Leuciscus idus (Golden orfe) - 46 - 100 mg/l - 96 h
Remarks: (External MSDS)

Toxicity to bacteria Remarks: (Hommel)
(butanedione)

12.2 Persistence and degradability

Biodegradability Result: - Readily biodegradable.

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 Endocrine disrupting properties  
No data available

12.7 Other adverse effects  
Discharge into the environment must be avoided.

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SECTION 13: Disposal considerations

13.1 Waste treatment methods  
No data available

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SECTION 14: Transport information

**DOT (US)**
- UN number: 2346  
- Class: 3  
- Packing group: II  
- Proper shipping name: Butanedione  
- Reportable Quantity (RQ): 
- Marine pollutant: yes  
- Poison Inhalation Hazard: No

**IMDG**
- UN number: 2346  
- Class: 3  
- Packing group: II  
- Proper shipping name: BUTANEDIONE  
- EMS-No: F-E, S-D

**IATA**
- UN number: 2346  
- Class: 3  
- Packing group: II  
- Proper shipping name: Butanedione

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SECTION 15: Regulatory information

**SARA 302 Components**  
This material does not contain any components with a section 302 EHS TPQ.

**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, Acute Health Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**
- butanedione  
  - CAS-No.: 431-03-8  
  - Revision Date: 2007-03-01

**Pennsylvania Right To Know Components**
- butanedione  
  - CAS-No.: 431-03-8  
  - Revision Date: 2007-03-01
SECTION 16: Other information

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: 6.6 Revision Date: 08/03/2023 Print Date: 08/04/2023