1 Identification

- **Product identifier**
  - Trade name: Sulforaphane
  - Article number: 10496
  - Application of the substance / the mixture
    This product is for research use - Not for human or veterinary diagnostic or therapeutic use.

- **Details of the supplier of the safety data sheet**
  - Manufacturer/Supplier:
    Cayman Chemical Co.
    1180 E. Ellsworth Rd.
    Ann Arbor, MI 48108
    USA
  - Information department: Product safety department
  - Emergency telephone number:
    During normal opening times: +1 (734) 971-3335
    US/CANADA: 800-424-9300
    Outside US/CANADA: 703-741-5970

2 Hazard(s) identification

- **Classification of the substance or mixture**
  - GHS02 Flame
    Flammable Liquids 2  H225 Highly flammable liquid and vapor.
  - GHS07
    Eye Irritation 2A  H319 Causes serious eye irritation.

- **Label elements**
  - GHS label elements
    The product is classified and labeled according to the Globally Harmonized System (GHS).

- **Hazard pictograms**
  - GHS02
  - GHS07

(Contd. on page 2)
Safety Data Sheet
acc. to OSHA HCS

Trade name: Sulforaphane

Signal word: Danger

Hazard statements:
H225 Highly flammable liquid and vapor.
H319 Causes serious eye irritation.

Precautionary statements:
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.
P264 Wash thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P303+P361+P353 If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P370+P378 In case of fire: Use CO2, powder or water spray to extinguish.
P403+P235 Store in a well-ventilated place. Keep cool.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

Classification system:
NFPA ratings (scale 0 - 4)

<table>
<thead>
<tr>
<th>HEALTH</th>
<th>FIRE</th>
<th>REACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Health = 2</td>
<td>Fire = 3</td>
<td>Reactivity = 0</td>
</tr>
</tbody>
</table>

HMIS-ratings (scale 0 - 4)

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</tr>
</tbody>
</table>

Other hazards:
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.

Chemical characterization: Mixtures
Description: Mixture of the substances listed below with nonhazardous additions.

Dangerous components:

<table>
<thead>
<tr>
<th>CAS</th>
<th>RTECS</th>
<th>Substance</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>64-17-5</td>
<td>KQ6300000</td>
<td>ethanol</td>
<td>97.5%</td>
</tr>
<tr>
<td>4478-93-7</td>
<td>EK4416000</td>
<td>Sulforaphane</td>
<td>2.5%</td>
</tr>
</tbody>
</table>
4 First-aid measures

- Description of first aid measures
- General information: Immediately remove any clothing soiled by the product.
- After inhalation: Supply fresh air; consult doctor in case of complaints.
- After skin contact: Immediately rinse with water.
- After eye contact: Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
- After swallowing: If symptoms persist consult doctor.
- Information for doctor:
  - Most important symptoms and effects, both acute and delayed
    No further relevant information available.
  - Indication of any immediate medical attention and special treatment needed
    No further relevant information available.

5 Fire-fighting measures

- Extinguishing media
  - Suitable extinguishing agents:
    CO2, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
  - Special hazards arising from the substance or mixture
    Can release vapors that form explosive mixtures at temperatures at or above the flashpoint.
    Container explosion may occur under fire conditions.
    Emits toxic fumes under fire conditions.
    Sensitive to static discharge.
    Vapors can travel to a source of ignition and flash back.
- Advice for firefighters
  - Protective equipment: No special measures required.

6 Accidental release measures

- Personal precautions, protective equipment and emergency procedures
  - Wear protective equipment. Keep unprotected persons away.
- Environmental precautions:
  - Dilute with plenty of water.
  - Do not allow to enter sewers/ surface or ground water.
- Methods and material for containment and cleaning up:
  - Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
  - Dispose contaminated material as waste according to section 13.
  - Ensure adequate ventilation.
- Reference to other sections
  - See Section 7 for information on safe handling.
  - See Section 8 for information on personal protection equipment.
  - See Section 13 for disposal information.
- Protective Action Criteria for Chemicals
  - PAC-1:
    | 64-17-5 ethanol | 1,800 ppm |
  - PAC-2:
    | 64-17-5 ethanol | 3300* ppm |
7 Handling and storage

- Handling:
  - Precautions for safe handling:
    No special precautions are necessary if used correctly.
    Avoid breathing dust/fume/gas/mist/vapours/spray.
    Avoid prolonged or repeated exposure.
    Keep away from sources of ignition.
    Take precautionary measures against static discharge.
  - Information about protection against explosions and fires:
    Keep ignition sources away - Do not smoke.
    Protect against electrostatic charges.
  - Conditions for safe storage, including any incompatibilities:
    - Storage: Store in accordance with information listed on the product insert.
    - Requirements to be met by storerooms and receptacles: Store in a cool location.
    - Information about storage in one common storage facility: Not required.
  - Further information about storage conditions:
    Keep receptacle tightly sealed.
    Store in cool, dry conditions in well sealed receptacles.

- Specific end use(s): No further relevant information available.

8 Exposure controls/personal protection

- Additional information about design of technical systems: No further data; see section 7.

- Control parameters
  - Components with limit values that require monitoring at the workplace:
    The following constituent is the only constituent of the product which has a PEL, TLV or other
    recommended exposure limit.
    At this time, the remaining constituent has no known exposure limits.

| PAC-3: | 64-17-5 ethanol | 15000* ppm |

- Additional information: The lists that were valid during the creation were used as basis.

- Exposure controls
  - Personal protective equipment:
    - General protective and hygienic measures:
      Keep away from foodstuffs, beverages and feed.
      Immediately remove all soiled and contaminated clothing.
      Wash hands before breaks and at the end of work.
      Avoid contact with the eyes.
      Avoid contact with the eyes and skin.
  - Breathing equipment: Not required.
· Protection of hands:

Protective gloves

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation. Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.

Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation

· Material of gloves

The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.

· Penetration time of glove material

The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.

· Eye protection:

Tightly sealed goggles

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9 Physical and chemical properties

· Information on basic physical and chemical properties

· General Information

· Appearance:
  - Form: Liquid
  - Color: According to product specification
· Odor: Characteristic
· Structural Formula: C6H11NOS2
· Molecular Weight: 177.3 g/mol
· Odor threshold: Not determined.
· Formulation: A solution in ethanol

· pH-value: Not determined.

· Change in condition
  - Melting point/Melting range: -114 °C (-173.2 °F)
  - Boiling point/Boiling range: 78 °C (172.4 °F)

· Flash point: 13 °C (55.4 °F)

· Flammability (solid, gaseous): Highly flammable.

· Auto igniting: 425 °C (797 °F)

· Decomposition temperature: Not determined.

· Ignition temperature: Product is not selfigniting.

· Danger of explosion: Product is not explosive. However, formation of explosive air/ vapor mixtures are possible.
Trade name: Sulforaphane

- explosion limits:
  - Lower: 3.3 Vol %
  - Upper: 19 Vol %
- vapor pressure at 20 °C (68 °F):
  - 59 hPa (44.3 mm Hg)
  - vapor pressure at 50 °C (122 °F):
  - 280 hPa (210 mm Hg)
- density at 20 °C (68 °F): 0.79 g/cm³ (6.59255 lbs/gal)
- relative density: Not determined.
- vapor density: Not determined.
- evaporation rate: Not determined.
- solubility in / miscibility with water at 20 °C (68 °F): 1,000 g/l
- partition coefficient (n-octanol/water): Not determined.

Viscosity:
- Dynamic at 20 °C (68 °F): 1.2 mPas
- Kinematic: Not determined.

Solubility:
- DMF: 3 mg/ml; DMSO: 16 mg/ml; Ethanol: 20 mg/ml; PBS (pH 7.2): 10 mg/ml
- Solvent content: 97.5 %
- VOC content: 97.50 %
  - 975.0 g/l / 8.14 lb/gal
- Solids content: 0.0 %
- Other information: No further relevant information available.

10 Stability and reactivity

- reactivity: No further relevant information available.
- chemical stability
- thermal decomposition / conditions to be avoided: No decomposition if used according to specifications.
- possibility of hazardous reactions: No dangerous reactions known.
- conditions to avoid: No further relevant information available.
- incompatible materials: No further relevant information available.
- hazardous decomposition products: No dangerous decomposition products known.

11 Toxicological information

- information on toxicological effects
- acute toxicity:
- LD/LC50 values that are relevant for classification:

<table>
<thead>
<tr>
<th>ATE (Acute Toxicity Estimate)</th>
<th>Oral</th>
<th>Inhalative</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD50</td>
<td>20,000 mg/kg</td>
<td></td>
</tr>
<tr>
<td>LC50/4 h</td>
<td>440 mg/l</td>
<td></td>
</tr>
</tbody>
</table>

(Contd. on page 7)
Trade name: Sulforaphane

64-17-5 ethanol

<table>
<thead>
<tr>
<th>Route</th>
<th>LD50</th>
<th>OECD Test Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral</td>
<td>10,470 mg/kg (rat)</td>
<td>401</td>
</tr>
</tbody>
</table>

Inhalative LC50/4 h: 117–125 mg/l (rat) OECD 403 (rat)

4478-93-7 Sulforaphane

<table>
<thead>
<tr>
<th>Route</th>
<th>TDLO</th>
<th>Oral TDLO 118 mg/kg (rat)</th>
</tr>
</thead>
</table>

- Primary irritant effect:
  - on the skin: No irritant effect.
  - on the eye: Irritating effect.
  - Sensitization: No sensitizing effects known.

- Additional toxicological information:
The product shows the following dangers according to internally approved calculation methods for preparations:
  - Irritant

- Carcinogenic categories
  - IARC (International Agency for Research on Cancer)
    - 64-17-5 ethanol 1
  - NTP (National Toxicology Program)
    - None of the ingredients is listed.
  - OSHA-Ca (Occupational Safety & Health Administration)
    - None of the ingredients is listed.

12 Ecological information

- Toxicity
  - Aquatic toxicity: No further relevant information available.
  - Persistence and degradability: No further relevant information available.
  - Behavior in environmental systems:
    - Bioaccumulative potential: No further relevant information available.
    - Mobility in soil: No further relevant information available.
  - Additional ecological information:
    - General notes:
      - Water hazard class 1 (Self-assessment): slightly hazardous for water
      - Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.

- Results of PBT and vPvB assessment
  - PBT: Not applicable.
  - vPvB: Not applicable.

- Other adverse effects: No further relevant information available.

13 Disposal considerations

- Waste treatment methods
  - Recommendation:
    - Must not be disposed of together with household garbage. Do not allow product to reach sewage system.
### 14 Transport information

<table>
<thead>
<tr>
<th><strong>UN-Number</strong></th>
<th>UN1170</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DOT, IMDG, IATA</strong></td>
<td>UN1170</td>
</tr>
<tr>
<td><strong>UN proper shipping name</strong></td>
<td>Ethanol solutions</td>
</tr>
<tr>
<td><strong>DOT</strong></td>
<td>ETHANOL SOLUTION (ETHYL ALCOHOL SOLUTION)</td>
</tr>
<tr>
<td><strong>IMDG</strong></td>
<td>Ethanol solution</td>
</tr>
<tr>
<td><strong>IATA</strong></td>
<td>Ethanol solution</td>
</tr>
</tbody>
</table>

#### Transport hazard class(es)

- **DOT**
  - Class: 3 Flammable liquids
  - Label: 3
- **IMDG, IATA**
  - Class: 3 Flammable liquids
  - Label: 3

#### Packing group

- **DOT, IMDG, IATA**
  - II

#### Environmental hazards:

- Not applicable.

#### Special precautions for user

- Warning: Flammable liquids
- **Hazard identification number (Kemler code):** 33
- **EMS Number:** F-E,S-D
- **Stowage Category:** A

#### Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

- Not applicable.

#### Transport/Additional information:

- **DOT**
  - Quantity limitations:
    - On passenger aircraft/rail: 5 L
    - On cargo aircraft only: 60 L
- **IMDG**
  - Limited quantities (LQ): 1L
Trade name: Sulforaphane

15 Regulatory information

· Safety, health and environmental regulations/legislation specific for the substance or mixture
  No further relevant information available.

· Sara
  · Section 355 (extremely hazardous substances):
    None of the ingredients is listed.
  · Section 313 (Specific toxic chemical listings):
    None of the ingredients is listed.

· TSCA (Toxic Substances Control Act):
  64-17-5 ethanol ACTIVE

· Hazardous Air Pollutants
  None of the ingredients is listed.

· Proposition 65
  · Chemicals known to cause cancer:
    None of the ingredients is listed.
  · Chemicals known to cause reproductive toxicity for females:
    None of the ingredients is listed.
  · Chemicals known to cause reproductive toxicity for males:
    None of the ingredients is listed.
  · Chemicals known to cause developmental toxicity:
    64-17-5 ethanol

· Carcinogenic categories
  · EPA (Environmental Protection Agency)
    None of the ingredients is listed.
  · TLV (Threshold Limit Value)
    64-17-5 ethanol A3
  · NIOSH-Ca (National Institute for Occupational Safety and Health)
    None of the ingredients is listed.
16 Other information

All chemicals may pose unknown hazards and should be used with caution. This SDS applies only to the material as packaged. If this product is combined with other materials, deteriorates, or becomes contaminated, it may pose hazards not mentioned in this SDS. Cayman Chemical Company assumes no responsibility for incidental or consequential damages, including lost profits, arising from the use of these data. It shall be the user's responsibility to develop proper methods of handling and personal protection based on the actual conditions of use. While this SDS is based on technical data judged to be reliable, Cayman Chemical Company assumes no responsibility for the completeness or accuracy of the information contained herein.

- **Department issuing SDS:** Environment protection department.
- **Contact:** -
- **Date of preparation / last revision** 04/25/2023
- **Abbreviations and acronyms:**
  - IMDG: International Maritime Code for Dangerous Goods
  - DOT: US Department of Transportation
  - IATA: International Air Transport Association
  - EINECS: European Inventory of Existing Commercial Chemical Substances
  - ELINCS: European List of Notified Chemical Substances
  - CAS: Chemical Abstracts Service (division of the American Chemical Society)
  - NFPA: National Fire Protection Association (USA)
  - HMIS: Hazardous Materials Identification System (USA)
  - VOC: Volatile Organic Compounds (USA, EU)
  - LC50: Lethal concentration, 50 percent
  - LD50: Lethal dose, 50 percent
  - PBT: Persistent, Bioaccumulative and Toxic
  - vPvB: very Persistent and very Bioaccumulative
  - NIOSH: National Institute for Occupational Safety
  - OSHA: Occupational Safety & Health
  - TLV: Threshold Limit Value
  - PEL: Permissible Exposure Limit
  - REL: Recommended Exposure Limit
  - Flammable Liquids 2: Flammable liquids – Category 2
  - Eye Irritation 2A: Serious eye damage/eye irritation – Category 2A
- * Data compared to the previous version altered.