Section 1. Identification of the Substance/Mixture and of the Company/Undertaking

1.1 Product Code: 15570
Product Name: Allicin
Synonyms: 2-propene-1-sulfinothioic acid, S-2-propen-1-yl ester; Diallyl Thiosulfinate;

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

Relevant identified uses: For research use only, not for human or veterinary use.

1.3 Details of the Supplier of the Safety Data Sheet:
Company Name: Cayman Chemical Company
1180 E. Ellsworth Rd.
Ann Arbor, MI  48108
Web site address: www.caymanchem.com
Information: Cayman Chemical Company +1  (734)971-3335

1.4 Emergency telephone number:
Emergency Contact: CHEMTREC Within USA and Canada: +1 (800)424-9300
CHEMTREC Outside USA and Canada: +1 (703)527-3887

Section 2. Hazards Identification

2.1 Classification of the Substance or Mixture:
Flammable Liquids, Category 2
Acute Toxicity: Inhalation, Category 3
Acute Toxicity: Oral, Category 3
Acute Toxicity: Skin, Category 3
Skin Corrosion/Irritation, Category 3
Specific Target Organ Toxicity (single exposure), Category 1

2.2 Label Elements:

GHS Signal Word: Danger
GHS Hazard Phrases:
H225: Highly flammable liquid and vapor.
H301: Toxic if swallowed.
H311: Toxic in contact with skin.
H316: Causes mild skin irritation.
H331: Toxic if inhaled.
H370: Causes damage to organs {eyes}.

GHS Precaution Phrases:
P210: Keep away from {heat/sparks/open flames/hot surfaces}. - No smoking.
P260: Do not breathe {dust/fume/gas/mist/vapors/spray}.
P264: Wash {hands} thoroughly after handling.
P280: Wear {protective gloves/protective clothing/eye protection/face protection}.

GHS Response Phrases:
P301+310: IF SWALLOWED: Immediately P311: Call a POISON CENTER or doctor/physician.
P302+352: IF ON SKIN: Wash with plenty of soap and water.
P303+361+353: IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305+310: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do so. Continue rinsing.
P308+311: If exposed or if concerned: Call a POISON CENTER/Doctor/...
P321: Specific treatment (see ... on this label).
P330: Rinse mouth.
P332+313: If skin irritation occurs, get medical advice/attention.
P361+364: Take off immediately all contaminated clothing and wash it before reuse.

GHS Storage and Disposal Phrases:
Please refer to Section 7 for Storage and Section 13 for Disposal information.

2.3 Adverse Human Health

Effects and Symptoms: Causes mild skin irritation.
Material may be irritating to the mucous membranes and upper respiratory tract.
May cause eye or respiratory system irritation.
Toxic if inhaled, swallowed, or in contact with skin.
To the best of our knowledge, the toxicological properties have not been thoroughly investigated.

Section 3. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>CAS # / RTECS #</th>
<th>Hazardous Components (Chemical Name) / REACH Registration No.</th>
<th>Concentration</th>
<th>EC No./ EC Index No.</th>
<th>GHS Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>539-86-6</td>
<td>S-Allyl acrylo-1-sulphinothioate 1.0 %</td>
<td>208-727-7</td>
<td>NA</td>
<td>Skin Corr. 2: H315</td>
</tr>
<tr>
<td>UD1900000</td>
<td></td>
<td></td>
<td></td>
<td>Eye Damage 2: H319</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>STOT (SE) 3: H335</td>
</tr>
<tr>
<td>67-56-1</td>
<td>Methanol 01-2119392409-28 59.45 %</td>
<td>200-659-6</td>
<td>603-001-00-X</td>
<td>Flam. Liq. 2: H225</td>
</tr>
<tr>
<td>PC1400000</td>
<td></td>
<td></td>
<td></td>
<td>Acute Tox.(O) 3: H301</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Acute Tox.(D) 3: H311</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Acute Tox.(I) 3: H331</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>STOT (SE) 1: H370</td>
</tr>
<tr>
<td>7732-18-5</td>
<td>Water na 39.45 %</td>
<td>231-791-2</td>
<td>NA</td>
<td>No GHS classifications apply.</td>
</tr>
<tr>
<td>ZC0110000</td>
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</tr>
<tr>
<td>64-18-6</td>
<td>Formic acid 01-2119491174-37 0.1 %</td>
<td>200-579-1</td>
<td>607-001-00-0</td>
<td>Skin Corr. 1A: H314</td>
</tr>
<tr>
<td>LQ4900000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Section 4. First Aid Measures

4.1 Description of First Aid Measures:

**In Case of Inhalation:** Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Get immediate medical attention.

**In Case of Skin Contact:** Immediately wash skin with soap and plenty of water for at least 15 minutes. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse.

**In Case of Eye Contact:** Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Have eyes examined and tested by medical personnel.

**In Case of Ingestion:** Wash out mouth with water provided person is conscious. Never give anything by mouth to an unconscious person. Get medical attention. Do NOT induce vomiting unless directed to do so by medical personnel.

4.2 Important Symptoms and Effects, Both Acute and Delayed:
Overexposure may cause: confusion, dermatitis, headache, drowsiness, dizziness, gastrointestinal disturbance, optic nerve damage (blindness), nausea, unconsciousness, vomiting, visual disturbance, weakness.
May cause convulsions.
Once methanol is absorbed into the body, it is very slowly eliminated.
Section 5. Fire Fighting Measures

5.1 Suitable Extinguishing Media: Use alcohol-resistant foam, carbon dioxide, water, or dry chemical spray.
Media: Use water spray to cool fire-exposed containers.

Unsuitable Extinguishing Media: A solid water stream may be inefficient.

5.2 Flammable Properties and Hazards: Can release vapors that form explosive mixtures at temperatures at or above the flashpoint.
Flash Pt: No data.
Flash Pt: No data.

Explosive Limits: LEL: No data. UEL: No data.

Autoignition Pt: No data.

Fire Fighting Instructions: As in any fire, wear self-contained breathing apparatus pressure-demand (NIOSH approved or equivalent), and full protective gear to prevent contact with skin and eyes.

Use alcohol-resistant foam, carbon dioxide, water, or dry chemical spray. Use water spray to cool fire-exposed containers.

Use alcohol-resistant foam, carbon dioxide, water, or dry chemical spray. Use water spray to cool fire-exposed containers.

Suitable Extinguishing Media: Use alcohol-resistant foam, carbon dioxide, water, or dry chemical spray.
Suitable Extinguishing Media: Use water spray to cool fire-exposed containers.

Unsuitable Extinguishing Media: A solid water stream may be inefficient.

5.3 Fire Fighting Instructions: As in any fire, wear self-contained breathing apparatus pressure-demand (NIOSH approved or equivalent), and full protective gear to prevent contact with skin and eyes.

Section 6. Accidental Release Measures

6.1 Protective Precautions, Protective Equipment and Emergency Procedures: Avoid raising and breathing dust, and provide adequate ventilation.

Protective Equipment and Emergency Procedures: As conditions warrant, wear a NIOSH approved self-contained breathing apparatus, or respirator, and appropriate personal protection (rubber boots, safety goggles, and heavy rubber gloves).

6.2 Environmental Precautions: Take steps to avoid release into the environment, if safe to do so.

6.3 Methods and Material For Containment and Cleaning: Contain spill and collect, as appropriate.

Transfer to a chemical waste container for disposal in accordance with local regulations.

Up:

Section 7. Handling and Storage

7.1 Precautions To Be Taken in Handling: Avoid breathing dust/fume/gas/mist/vapours/spray.

Precautions To Be Taken in Handling: Avoid prolonged or repeated exposure.

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.

Precautions To Be Taken in Storing: Keep away from heat, sparks, and flame.

Precautions To Be Taken in Storing: Keep container tightly closed.

Keep container tightly closed.
Store in accordance with information listed on the product insert.

7.2 Precautions To Be Taken in Storing: Keep away from heat, sparks, and flame.

Precautions To Be Taken in Storing: Keep container tightly closed.

Store in accordance with information listed on the product insert.

Section 8. Exposure Controls/Personal Protection

8.1 Exposure Parameters:

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Chemical Name</th>
<th>Jurisdiction</th>
<th>Recommended Exposure Limits</th>
<th>Notations</th>
</tr>
</thead>
<tbody>
<tr>
<td>67-56-1</td>
<td>Methanol</td>
<td>ACGIH TLV</td>
<td>TLV: 200 ppm&lt;br&gt;STEL: 250 ppm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Europe</td>
<td>TWA: 260 mg/m3 (200 ppm)</td>
<td>Skin Absorption</td>
</tr>
<tr>
<td></td>
<td></td>
<td>France VL</td>
<td>TWA: 260 mg/m3 (200 ppm)&lt;br&gt;STEL: 1300 mg/m3 (1000 ppm)</td>
<td>Skin Absorption</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OSHA PELs</td>
<td>PEL: 200 ppm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Britain EH40</td>
<td>TWA: 266 mg/m3 (200 ppm)&lt;br&gt;STEL: 333 mg/m3 (250 ppm)</td>
<td>Skin Absorption</td>
</tr>
</tbody>
</table>
8.2 Exposure Controls:

8.2.1 Engineering Controls: Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

8.2.2 Personal protection equipment:

Eye Protection: Safety glasses
Protective Gloves: Compatible chemical-resistant gloves
Other Protective Clothing: Lab coat
Respiratory Equipment: NIOSH approved respirator, as conditions warrant.

Work/Hygienic/Maintenance Practices: Facilities storing or utilizing this material should be equipped with an eyewash and a safety shower. Wash thoroughly after handling.

No data available.

Section 9. Physical and Chemical Properties

9.1 Information on Basic Physical and Chemical Properties

Physical States: [ ] Gas [X] Liquid [ ] Solid
Appearance and Odor: A solution in methanol:water:formic acid
pH: No data.
Melting Point: No data.
Boiling Point: No data.
Flash Pt: No data.
Evaporation Rate: No data.
Flammability (solid, gas): No data available.
 Explosive Limits: LEL: No data. UEL: No data.
Vapor Pressure (vs. Air or mm Hg): No data.
Vapor Density (vs. Air = 1): No data.
Specific Gravity (Water = 1): No data.
Solubility in Water: No data.
Octanol/Water Partition Coefficient: No data.
Allicin

SAFETY DATA SHEET

9.2 Other Information

Autoignition Pt: No data.
Decomposition Temperature: No data.
Viscosity: No data.
Percent Volatile: No data.
Molecular Formula & Weight: C6H10OS2 162.3

Section 10. Stability and Reactivity

10.1 Reactivity: No data available.
10.2 Stability: Unstable [ ] Stable [ X ]
10.3 Stability Note(s): Stable if stored in accordance with information listed on the product insert.
10.4 Conditions To Avoid: heat, flames, and sparks
10.5 Incompatibility - Materials
To Avoid: acids
                acid anhydrides
                acid chlorides
                alkali metals
                oxidizing agents
                reducing agents
10.6 Hazardous Decomposition or Byproducts:

                carbon dioxide
                carbon monoxide
                hydrogen sulfide

Section 11. Toxicological Information

11.1 Information on Toxicological Effects: The toxicological effects of this product have not been thoroughly studied.
Allicin - Toxicity Data: Subcutaneous LD50 (mouse): 120 mg/kg;
Methanol - Toxicity Data: Oral LD50 (rat): 5,600 mg/kg; Oral LD50 (rabbit): 14,200 mg/kg;
Inhalation LC50 (rat): 64,000 ppm (4h); Inhalation LC50 (mouse): 61,100 ppm (134 m); Skin LD50 (rabbit): 15,800 mg/kg; Oral LDLO (human): 143 mg/kg;
Methanol - Irritation Data: Skin (rabbit): 20 mg (24h) moderate; Eyes (rabbit): 40 mg moderate;
Eyes (rabbit): 100 mg (24h) moderate;

Chronic Toxicological Effects: Allicin - Investigated as a drug and natural product.
Methanol - Investigated as a drug, mutagen, primary irritant, reproductive effector, and tumorigen.
Only select Registry of Toxic Effects of Chemical Substances (RTECS) data is presented here.
See actual entry in RTECS for complete information.

Allicin RTECS Number: UD1900000
Methanol RTECS Number: PC1400000

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>NTP</th>
<th>IARC</th>
<th>ACGIH</th>
<th>OSHA</th>
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<tbody>
<tr>
<td>539-86-6</td>
<td>S-Allyl acrylo-1-sulphinothioate</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>67-56-1</td>
<td>Methanol</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
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<td>7732-18-5</td>
<td>Water</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
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<td>64-18-6</td>
<td>Formic acid</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>
Section 12. Ecological Information

12.1 Toxicity: Avoid release into the environment. Runoff from fire control or dilution water may cause pollution.

12.2 Persistence and Degradability: No data available.

12.3 Bioaccumulative Potential: No data available.

12.4 Mobility in Soil: No data available.

12.5 Results of PBT and vPvB assessment: No data available.

12.6 Other adverse effects: No data available.

Section 13. Disposal Considerations

13.1 Waste Disposal Method: Dispose in accordance with local, state, and federal regulations.

Section 14. Transport Information

14.1 LAND TRANSPORT (US DOT):

DOT Proper Shipping Name: Methanol Solution
DOT Hazard Class: 3 (6.1) FLAMMABLE LIQUID, POISON
UN/NA Number: UN1230 Packing Group: III

14.1 LAND TRANSPORT (European ADR/RID):

ADR/RID Shipping Name: Methanol Solution
UN Number: 1230 Packing Group: III
Hazard Class: 3 (6.1) - FLAMMABLE LIQUID, POISON

14.3 AIR TRANSPORT (ICAO/IATA):

ICAO/IATA Shipping Name: Methanol Solution
UN Number: 1230 Packing Group: III
Hazard Class: 3 (6.1) - FLAMMABLE LIQUID, POISON
IATA Classification: 3, 6.1

Additional Transport Information:
Transport in accordance with local, state, and federal regulations.

When sold in quantities of less than or equal to 1 mL, or 1 g, with an Excepted Quantity Code of E1, E2, E4, or E5, this item meets the De Minimis Quantities exemption, per IATA 2.6.10. Therefore packaging does not have to be labeled as Dangerous Goods/Excepted Quantity.

Section 15. Regulatory Information

EPA SARA (Superfund Amendments and Reauthorization Act of 1986) Lists

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>S. 302 (EHS)</th>
<th>S. 304 RQ</th>
<th>S. 313 (TRI)</th>
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<tr>
<td>539-86-6</td>
<td>S-Allyl acrylo-1-sulphinothioate</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>67-56-1</td>
<td>Methanol</td>
<td>No</td>
<td>Yes 5000 LB</td>
<td>Yes</td>
</tr>
<tr>
<td>7732-18-5</td>
<td>Water</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>64-18-6</td>
<td>Formic acid</td>
<td>No</td>
<td>Yes 5000 LB</td>
<td>Yes</td>
</tr>
<tr>
<td>CAS #</td>
<td>Hazardous Components (Chemical Name)</td>
<td>Other US EPA or State Lists</td>
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<td></td>
</tr>
<tr>
<td>539-86-6</td>
<td>S-Allyl acrylo-1-sulphinothioate</td>
<td>CAA HAP, ODC: No; CWA NPDES: No; TSCA: No; CA PROP.65: No</td>
<td></td>
<td></td>
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<tr>
<td>67-56-1</td>
<td>Methanol</td>
<td>CAA HAP, ODC: HAP; VHAP; CWA NPDES: No; TSCA: Yes - Inventory; CA PROP.65: Yes: RDTox.</td>
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<tr>
<td>7732-18-5</td>
<td>Water</td>
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<tr>
<td>64-18-6</td>
<td>Formic acid</td>
<td>CAA HAP, ODC: No; CWA NPDES: No; TSCA: Yes - Inventory; CA PROP.65: No</td>
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<td></td>
</tr>
</tbody>
</table>

**Regulatory Information**

No data available.

**Additional Information About This Product:**

DISCLAIMER: This information is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.

**Company Policy or Disclaimer:**

This SDS was prepared in accordance with 29 CFR 1910.1200 and Regulation (EC) No.1272/2008.

**Revision Date:**

12/06/2018

**Additional Information About This Product:**

No data available.