1. Identification

Product identifier: FARNESENE, MIXTURE OF ISOMERS

Other means of identification:
- BRI Product Code: 808
- FEMA number: 3839
- Synonyms: FEMA CAS: 502-61-4 * Contains 1,3,6,10-Dodecatetraene, 3,7,11-trimethyl-, (3E,6E)- [502-61-4]

Recommended use: For Manufacturing Use Only

Recommended restrictions: Not for use in Tobacco or Nicotine delivery device applications and/or products.

Manufacturer/Importer/Supplier/Distributor information:
- Manufacturer: Bedoukian Research
  - Address: 6 Commerce Drive, Danbury, CT 06810, United States
  - Telephone: 1-203-830-4000
  - Website: www.bedoukian.com
  - E-mail: customerservice@bedoukian.com
  - Contact person: Joseph Bania

2. Hazard(s) identification

Physical hazards: Not classified.

Health hazards:
- Skin corrosion/irritation: Category 2
- Sensitization, skin: Category 1B
- Aspiration hazard: Category 1

Environmental hazards:
- Hazardous to the aquatic environment, acute hazard: Category 3
- Hazardous to the aquatic environment, long-term hazard: Category 3

OSHA defined hazards: Not classified.

Label elements:
- Signal word: Danger
- Hazard statement: May be fatal if swallowed and enters airways. Causes skin irritation. May cause an allergic skin reaction. Harmful to aquatic life with long lasting effects.

Precautionary statement:
- Prevention: Avoid breathing mist or vapor. Wash thoroughly after handling. Contaminated work clothing must not be allowed out of the workplace. Avoid release to the environment. Wear protective gloves.
- Response: If swallowed: Immediately call a poison center/doctor. Do NOT induce vomiting. If on skin: Wash with plenty of water. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
- Storage: Store locked up.
- Disposal: Dispose of contents/container in accordance with local/regional/national/international regulations. Dispose of contents/container in accordance with relevant area regulations.
Hazard(s) not otherwise classified (HNOC)

None known.

Supplemental information

25.41% of the mixture consists of component(s) of unknown acute oral toxicity. 25.41% of the mixture consists of component(s) of unknown acute dermal toxicity. 25.41% of the mixture consists of component(s) of unknown acute inhalation toxicity. 25.41% of the mixture consists of component(s) of unknown acute hazards to the aquatic environment. 25.41% of the mixture consists of component(s) of unknown long-term hazards to the aquatic environment. Contains BISABOLENE ISOMERS, NEROLIDOL FCC. May produce an allergic reaction.

3. Composition/information on ingredients

Mixtures

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>Common name and synonyms</th>
<th>CAS number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>BISABOLENE ISOMERS</td>
<td></td>
<td>495-62-5</td>
<td>36.32</td>
</tr>
<tr>
<td>alpha-FARNESENE</td>
<td></td>
<td>502-61-4</td>
<td>25.41</td>
</tr>
<tr>
<td>beta-FARNESENE</td>
<td></td>
<td>18794-84-8</td>
<td>16.45</td>
</tr>
<tr>
<td>OTHER C15H24 COMPOUNDS</td>
<td></td>
<td>Mixture</td>
<td>12.72</td>
</tr>
<tr>
<td>UNIDENTIFIED</td>
<td></td>
<td>N/A</td>
<td>6.62</td>
</tr>
<tr>
<td>NEROLIDOL FCC</td>
<td>1,6,10-Dodecaatrien-3-ol, 3,7,11-trimethyl-3,7,11-Trimethyl-1,6,10-dodecaatrien-3-ol</td>
<td>7212-44-4</td>
<td>1.38</td>
</tr>
<tr>
<td>VALENCENE</td>
<td></td>
<td>4630-07-3</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Stabilizers

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>Common name and synonyms</th>
<th>CAS number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>synthetic alpha tocopherol</td>
<td></td>
<td>10191-41-0</td>
<td>0.1</td>
</tr>
</tbody>
</table>

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

Composition comments

Occupational Exposure Limits for stabilizers are listed in Section 8.

4. First-aid measures

Inhalation
Move to fresh air. Call a physician if symptoms develop or persist.

Skin contact
Remove contaminated clothing immediately and wash skin with soap and water. In case of eczema or other skin disorders: Seek medical attention and take along these instructions. Wash contaminated clothing before reuse.

Eye contact
Rinse with water. Get medical attention if irritation develops and persists.

Ingestion
Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn’t get into the lungs.

Most important symptoms/effects, acute and delayed
Aspiration may cause pulmonary edema and pneumonitis. Skin irritation. May cause redness and pain. May cause an allergic skin reaction. Dermatitis. Rash.

Indication of immediate medical attention and special treatment needed
Provide general supportive measures and treat symptomatically. Keep victim under observation. Symptoms may be delayed.

General information
Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse.

5. Fire-fighting measures

Suitable extinguishing media
Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).

Unsuitable extinguishing media
Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards arising from the chemical
During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters
Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

Fire fighting equipment/instructions
Move containers from fire area if you can do so without risk.

Specific methods
Use standard firefighting procedures and consider the hazards of other involved materials.

General fire hazards
No unusual fire or explosion hazards noted.
6. Accidental release measures

**Personal precautions, protective equipment and emergency procedures**
- Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Wear appropriate protective equipment and clothing during clean-up. Avoid breathing mist or vapor. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

**Methods and materials for containment and cleaning up**
- Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water.
- Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.
- Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

**Environmental precautions**
- Avoid release to the environment. Inform appropriate managerial or supervisory personnel of all environmental releases. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

**Precautions for safe handling**
- Avoid breathing mist or vapor. Avoid contact with eyes, skin, and clothing. Provide adequate ventilation. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Avoid release to the environment. Observe good industrial hygiene practices.

**Conditions for safe storage, including any incompatibilities**
- Store locked up. Store in original tightly closed container. Store away from incompatible materials (see Section 10 of the SDS). Store tightly sealed under inert gas below 0 deg. C Recommended Packaging: Glass, Plastic, Aluminum or Phenolic Lined Steel.

8. Exposure controls/personal protection

**Occupational exposure limits**
- This mixture has no ingredients that have PEL, TLV, or other recommended exposure limit.

**Biological limit values**
- No biological exposure limits noted for the ingredient(s).

**Appropriate engineering controls**
- Good general ventilation (typically 10 air changes per hour) should be used.Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airbeone levels below recommended exposure limits. If exposure limits have not been established, maintain airbeone levels to an acceptable level. Eye wash fountain and emergency showers are recommended.

**Individual protection measures, such as personal protective equipment**
- **Eye/face protection**
  - Face shield is recommended. Wear safety glasses with side shields (or goggles).
- **Skin protection**
  - **Hand protection**
    - Wear appropriate chemical resistant gloves.
  - **Other**
    - Wear appropriate chemical resistant clothing. Use of an impervious apron is recommended.
- **Respiratory protection**
  - In case of insufficient ventilation, wear suitable respiratory equipment.
- **Thermal hazards**
  - Wear appropriate thermal protective clothing, when necessary.

**General hygiene considerations**
- Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Contaminated work clothing should not be allowed out of the workplace.

9. Physical and chemical properties

**Appearance**
- **Physical state**: Liquid.
- **Color**: pale yellow to yellow
- **Odor**: citrus, herbaceous, lavender background
- **Odor threshold**: Not available.
- **pH**: Not available.
- **Melting point/freezing point**: Not available.
- **Initial boiling point and boiling range**: Not available.
- **Flash point**: 230 °F (110 °C) Closed Cup
Evaporation rate Not available.
Flammability (solid, gas) Not applicable.

Upper/lower flammability or explosive limits

Flammability limit - lower (%)
Flammability limit - upper (%)
Explosive limit - lower (%)
Explosive limit - upper (%)

Vapor pressure 0.03 hPa estimated
Vapor density Not available.
Relative density Not available.

Solubility(ies)
Solubility (water) Not available.
Partition coefficient (n-octanol/water) 7.1

Auto-ignition temperature Not available.
Decomposition temperature Not available.
Viscosity Not available.

Other information
Density 0.844 - 0.879 g/cm³

10. Stability and reactivity
Reactivity The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability Material is stable under normal conditions.
Possibility of hazardous reactions No dangerous reaction known under conditions of normal use.
Conditions to avoid Contact with incompatible materials.
Incompatible materials Strong oxidizing agents.
Hazardous decomposition products No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation May cause allergy or asthma symptoms or breathing difficulties if inhaled.
Skin contact Causes skin irritation. May cause an allergic skin reaction.
Eye contact Direct contact with eyes may cause temporary irritation.
Ingestion Droplets of the product aspirated into the lungs through ingestion or vomiting may cause a serious chemical pneumonia.

Symptoms related to the physical, chemical and toxicological characteristics
Aspiration may cause pulmonary edema and pneumonitis. Skin irritation. May cause redness and pain. May cause an allergic skin reaction. Dermatitis. Rash.

Information on toxicological effects
Acute toxicity May be fatal if swallowed and enters airways.
<table>
<thead>
<tr>
<th>Components</th>
<th>Species</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEROLIDOL FCC (CAS 7212-44-4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Acute</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dermal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid</td>
<td>Rabbit</td>
<td>&gt; 5000 mg/kg</td>
</tr>
<tr>
<td>Oral</td>
<td>Rat</td>
<td>&gt; 5000 mg/kg</td>
</tr>
<tr>
<td><strong>Estimates for product may be based on additional component data not shown.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Skin corrosion/irritation</strong></td>
<td>Causes skin irritation.</td>
<td></td>
</tr>
<tr>
<td>Irritation Corrosion - Skin</td>
<td>4 % Patch test, Vehicle Petrolatum.</td>
<td></td>
</tr>
<tr>
<td>Result: No irritation observed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Species: Human</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organ: Skin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes: RIFM</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Serious eye damage/eye irritation</strong></td>
<td>Direct contact with eyes may cause temporary irritation.</td>
<td></td>
</tr>
<tr>
<td><strong>Respiratory or skin sensitization</strong></td>
<td>Not a respiratory sensitizer.</td>
<td></td>
</tr>
<tr>
<td>Respiratory sensitization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin sensitization</td>
<td>May cause an allergic skin reaction.</td>
<td></td>
</tr>
<tr>
<td>Skin sensitization</td>
<td>4 % Patch test, Vehicle Petrolatum.</td>
<td></td>
</tr>
<tr>
<td>Result: Not sensitizing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Species: Human</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organ: Skin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes: RIFM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OECD 429, Calculated EC3: 4.9%. Vehicle Methyl Ethyl Ketone, MEK.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Result: Sensitization noted.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Species: Mouse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organ: Skin</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Germ cell mutagenicity</strong></td>
<td>No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.</td>
<td></td>
</tr>
<tr>
<td><strong>Carcinogenicity</strong></td>
<td>Not classifiable as to carcinogenicity to humans.</td>
<td></td>
</tr>
<tr>
<td><strong>IARC Monographs. Overall Evaluation of Carcinogenicity</strong></td>
<td>Not listed.</td>
<td></td>
</tr>
<tr>
<td><strong>US. National Toxicology Program (NTP) Report on Carcinogens</strong></td>
<td>Not listed.</td>
<td></td>
</tr>
<tr>
<td><strong>Reproductive toxicity</strong></td>
<td>This product is not expected to cause reproductive or developmental effects.</td>
<td></td>
</tr>
<tr>
<td>Specific target organ toxicity - single exposure</td>
<td>Not classified.</td>
<td></td>
</tr>
<tr>
<td>Specific target organ toxicity - repeated exposure</td>
<td>Not classified.</td>
<td></td>
</tr>
<tr>
<td><strong>Aspiration hazard</strong></td>
<td>May be fatal if swallowed and enters airways.</td>
<td></td>
</tr>
<tr>
<td><strong>Further information</strong></td>
<td>May cause allergic respiratory and skin reactions.</td>
<td></td>
</tr>
<tr>
<td><strong>12. Ecological information</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ecotoxicity</strong></td>
<td>Harmful to aquatic life with long lasting effects.</td>
<td></td>
</tr>
</tbody>
</table>
**Product Test Results**

### Species

**FARNESENE, MIXTURE OF ISOMERS**

#### Aquatic

##### Acute

<table>
<thead>
<tr>
<th>Species</th>
<th>EC50</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crustacea</td>
<td></td>
<td>110 µg/l, 48 hr Test material identified as alpha-farnesene CAS: 502-61-4.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Species</th>
<th>NOEC</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daphnia</td>
<td></td>
<td>11.7 µg/l, 48 hr Test material identified as alpha-farnesene CAS: 502-61-4.</td>
</tr>
</tbody>
</table>

#### Components

<table>
<thead>
<tr>
<th>Species</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEROLIDOL FCC (CAS 7212-44-4)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Species</th>
<th>LC50</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish</td>
<td></td>
<td>Fathead minnow (Pimephales promelas) 1.3 - 1.58 mg/l, 96 hours</td>
</tr>
</tbody>
</table>

* Estimates for product may be based on additional component data not shown.

### Persistence and degradability

No data is available on the degradability of this product.

### Bioaccumulative potential

<table>
<thead>
<tr>
<th>Partition coefficient n-octanol / water (log Kow)</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>FARNESENE, MIXTURE OF ISOMERS</td>
<td>7.1</td>
</tr>
<tr>
<td>NEROLIDOL FCC</td>
<td>5.68</td>
</tr>
</tbody>
</table>


### Mobility in soil

No data available.

### Other adverse effects

No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

### 13. Disposal considerations

#### Disposal instructions

Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.

#### Local disposal regulations

Dispose in accordance with all applicable regulations.

#### Hazardous waste code

The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

#### Waste from residues / unused products

Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

#### Contaminated packaging

Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

### 14. Transport information

#### DOT

Not regulated as dangerous goods.

#### IATA

Not regulated as dangerous goods.

#### IMDG

Not regulated as dangerous goods.

#### Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not established.

### 15. Regulatory information

#### US federal regulations

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

- **TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)**
  - Not regulated.
- **CERCLA Hazardous Substance List (40 CFR 302.4)**
  - Not listed.
SARA 304 Emergency release notification
Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)
Not regulated.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

<table>
<thead>
<tr>
<th>Hazard categories</th>
<th>Immediate Hazard - Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Delayed Hazard - No</td>
</tr>
<tr>
<td></td>
<td>Fire Hazard - No</td>
</tr>
<tr>
<td></td>
<td>Pressure Hazard - No</td>
</tr>
<tr>
<td></td>
<td>Reactivity Hazard - No</td>
</tr>
</tbody>
</table>

SARA 302 Extremely hazardous substance
Not listed.

SARA 311/312 Hazardous chemical
Yes

SARA 313 (TRI reporting)
Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List
Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)
Not regulated.

Safe Drinking Water Act (SDWA)
Not regulated.

US state regulations
California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

<table>
<thead>
<tr>
<th>Country(s) or region</th>
<th>Inventory name</th>
<th>On inventory (yes/no)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Australian Inventory of Chemical Substances (AICS)</td>
<td>Yes</td>
</tr>
<tr>
<td>Canada</td>
<td>Domestic Substances List (DSL)</td>
<td>Yes</td>
</tr>
<tr>
<td>Canada</td>
<td>Non-Domestic Substances List (NDSL)</td>
<td>No</td>
</tr>
<tr>
<td>China</td>
<td>Inventory of Existing Chemical Substances in China (IECSC)</td>
<td>Yes</td>
</tr>
<tr>
<td>Europe</td>
<td>European Inventory of Existing Commercial Chemical Substances (EINECS)</td>
<td>Yes</td>
</tr>
<tr>
<td>Europe</td>
<td>European List of Notified Chemical Substances (ELINCS)</td>
<td>No</td>
</tr>
<tr>
<td>Japan</td>
<td>Inventory of Existing and New Chemical Substances (ENCS)</td>
<td>No</td>
</tr>
<tr>
<td>Korea</td>
<td>Existing Chemicals List (ECL)</td>
<td>No</td>
</tr>
<tr>
<td>New Zealand</td>
<td>New Zealand Inventory</td>
<td>No</td>
</tr>
<tr>
<td>Philippines</td>
<td>Philippine Inventory of Chemicals and Chemical Substances (PICCS)</td>
<td>Yes</td>
</tr>
<tr>
<td>Taiwan</td>
<td>Taiwan Toxic Chemical Substances (TCS)</td>
<td>Yes</td>
</tr>
<tr>
<td>United States &amp; Puerto Rico</td>
<td>Toxic Substances Control Act (TSCA) Inventory</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*"Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s).

16. Other information, including date of preparation or last revision

| Issue date           | 25-May-2015 |
| Revision date        | 03-May-2019 |
| Version #            | 08          |

Disclaimer
Bedoukian Research cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user’s responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available.
Composition / Information on Ingredients: Ingredients
Exposure controls/personal protection: Hand protection
Physical & Chemical Properties: Multiple Properties
Toxicological information: Skin contact