1. Identification

Product identifier: 2-DODECENAL (HIGH TRANS) FCC

Other means of identification:
- BRI Product Code: 356
- CAS number: 20407-84-5
- FEMA number: 2402
- Synonyms: 2-Dodecenal; 2-Dodecenal; dodec-2-en-1-al; e-2-Dodecenal; trans-2-Dodecen-1-al

Recommended use: Flavors and fragrances

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

Manufacturer/Importer/Supplier/Distributor information

Manufacturer:
- Company name: 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

Emergency phone number:
- Chemtrec (North America): 1-800-424-9300
- Chemtrec (International): 1-703-527-3887

2. Hazard(s) identification

Physical hazards: Not classified.

Health hazards:
- Acute toxicity, dermal: Category 5
- Skin corrosion/irritation: Category 2
- Serious eye damage/eye irritation: Category 2A
- Sensitization, skin: Category 1B

Environmental hazards: Hazardous to the aquatic environment, acute hazard: Category 1

OSHA defined hazards: Not classified.

Label elements:

Signal word: Warning

Hazard statement:
May be harmful in contact with skin. Causes skin irritation. May cause an allergic skin reaction. Causes serious eye irritation. Very toxic to aquatic life.

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 eye protection/face protection. Wear protective gloves.

Response:
If on skin: Wash with plenty of water. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a poison center/doctor if you feel unwell. If skin irritation or rash occurs: Get medical advice/attention. If eye irritation persists: Get medical advice/attention. Take off contaminated clothing and wash before reuse. Collect spillage.
Storage
Store away from incompatible materials.

Disposal
Dispose of contents/container in accordance with relevant area regulations.

Hazard(s) not otherwise classified (HNOC)
None known.

Supplemental information
Contains 2-DODECENAL (HIGH TRANS) FCC. May produce an allergic reaction.

3. Composition/information on ingredients

Substances

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>Common name and synonyms</th>
<th>CAS number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-DODECENAL (HIGH TRANS) FCC</td>
<td>(* Alt. CAS #) CAS: 4826-62-4; 2-Dodecenal 2-Dodecenal dodec-2-en-1-al e-2-Dodecenal trans-2-Dodecen-1-al</td>
<td>20407-84-5</td>
<td>100</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>0.5</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. Get medical advice/attention if you feel unwell. In case of eczema or other skin disorders: Seek medical attention and take along these instructions. Wash contaminated clothing before reuse.

Eye contact
Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists.

Ingestion
Rinse mouth. Get medical advice/attention if you feel unwell.

Most important symptoms/effects, acute and delayed
Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. 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. Show this safety data sheet to the doctor in attendance. 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.
Prevent entry into waterways, sewer, basements or confined areas.

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. When using, do not eat, drink or smoke. Provide adequate ventilation. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Avoid release to the environment. Wash contaminated clothing before reuse. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities

Store in original tightly closed container. Store away from incompatible materials (see Section 10 of the SDS). Recommended Packaging: Glass, Aluminum or Phenolic Lined Steel. Store tightly sealed under inert gas in a cool, well-ventilated area.

8. Exposure controls/personal protection

Occupational exposure limits

This substance has no 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 airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Provide eyewash station. 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. Select suitable chemical resistant protective gloves (EN 374) with a protective index 6 (>480min permeation time).

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

slightly yellow

Odor

mandarin orange-like odor.

Odor threshold

Not available.

pH

Not available.

Melting point/freezing point

Not available.

Initial boiling point and boiling range


Flash point

247 °F (119 °C) Closed Cup Bedoukian obtained value.

Evaporation rate

Not available.

Flammability (solid, gas)

Not applicable.
Upper/lower flammability or explosive limits

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammability limit - lower (%)</td>
<td>Not available.</td>
</tr>
<tr>
<td>Flammability limit - upper (%)</td>
<td>Not available.</td>
</tr>
<tr>
<td>Explosive limit - lower (%)</td>
<td>Not available.</td>
</tr>
<tr>
<td>Explosive limit - upper (%)</td>
<td>Not available.</td>
</tr>
</tbody>
</table>

Vapor pressure
0.01 mmHg at 20°C; US EPA. 2014. Estimation Programs Interface Suite™ for Microsoft® Windows, v 4.11. US EPA, Washington, DC, USA.

Vapor density
6.3 Relative to air; air = 1

Relative density
Not available.

Solubility(ies)

<table>
<thead>
<tr>
<th>Solubility (water)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not available.</td>
<td></td>
</tr>
</tbody>
</table>

Partition coefficient

Auto-ignition temperature
Not available.

Decomposition temperature
Not available.

Viscosity
Not available.

Other information

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>0.839 - 0.849 g/cm³</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>Not explosive.</td>
</tr>
<tr>
<td>Flammability class</td>
<td>Combustible IIIB estimated</td>
</tr>
<tr>
<td>Molecular formula</td>
<td>C12H22O</td>
</tr>
<tr>
<td>Molecular weight</td>
<td>182.30</td>
</tr>
<tr>
<td>Oxidizing properties</td>
<td>Not oxidizing.</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>0.839 - 0.849 at 25°C</td>
</tr>
</tbody>
</table>

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

Toxicological information
2-DODECENAL (HIGH TRANS) FCC

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-DODECENAL (HIGH TRANS) FCC</td>
<td>500 - 2000 mg/kg OECD 474, In vivo Mouse Micronucleus Test.</td>
</tr>
<tr>
<td>Vehicle Corn oil. Dose orally administered.</td>
<td></td>
</tr>
<tr>
<td>Result: Not mutagenic.</td>
<td></td>
</tr>
<tr>
<td>Species: Mouse</td>
<td></td>
</tr>
<tr>
<td>Notes: RIFM</td>
<td></td>
</tr>
</tbody>
</table>

Information on likely routes of exposure

<table>
<thead>
<tr>
<th>Route</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhalation</td>
<td>May cause allergy or asthma symptoms or breathing difficulties if inhaled.</td>
</tr>
<tr>
<td>Skin contact</td>
<td>May be harmful in contact with skin. Causes skin irritation. May cause an allergic skin reaction.</td>
</tr>
<tr>
<td>Eye contact</td>
<td>Causes serious eye irritation.</td>
</tr>
<tr>
<td>Ingestion</td>
<td>Expected to be a low ingestion hazard.</td>
</tr>
<tr>
<td>Symptoms related to the physical, chemical and toxicological characteristics</td>
<td>Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Skin irritation. May cause redness and pain. May cause an allergic skin reaction. Dermatitis. Rash.</td>
</tr>
</tbody>
</table>

Information on toxicological effects

<table>
<thead>
<tr>
<th>Toxicity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute toxicity</td>
<td>May be harmful in contact with skin.</td>
</tr>
<tr>
<td>Product</td>
<td>Species</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>2-DODECENAL (HIGH TRANS) FCC (CAS 20407-84-5)</td>
<td></td>
</tr>
<tr>
<td><strong>Acute</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Dermal</strong></td>
<td></td>
</tr>
<tr>
<td>Liquid</td>
<td>Rabbit</td>
</tr>
<tr>
<td><strong>Oral</strong></td>
<td></td>
</tr>
<tr>
<td>Liquid</td>
<td>Rat</td>
</tr>
<tr>
<td>* Estimates for product may be based on additional component data not shown.</td>
<td></td>
</tr>
</tbody>
</table>

**Skin corrosion/irritation**

- Causes skin irritation.

**Irritation**

- **Corrosion - Skin**
  - 2-DODECENAL (HIGH TRANS) FCC 1 % Patch test, Vehicle Petrolatum.
  - Result: No irritation observed.
  - Species: Human
  - Organ: Skin
  - Notes: RIFM
  - 5000 mg/kg LD50, Irritation evaluated on day 1 of an LD50 study, 5 animals evaluated. Ulcerated and crusted treated skin at necropsy.
  - Result: Irritation noted.
  - Species: Rabbit
  - Organ: Skin
  - Notes: RIFM

**Serious eye damage/eye irritation**

- Causes serious eye irritation.

**Irritation**

- **Corrosion - Eye**
  - 2-DODECENAL (HIGH TRANS) FCC 0.125 %, Irritation clear on day 7. Vehicle Ethanol SDA 39C.
  - Result for similar material 2-Decenal.
  - Result: Irritation noted.
  - Species: Rabbit
  - Organ: Eye
  - Observation Period: 7 days
  - Severity: mild
  - Notes: RIFM

**Respiratory or skin sensitization**

- **Respiratory sensitization**
  - Not a respiratory sensitizer.

- **Skin sensitization**
  - May cause an allergic skin reaction.

**Skin sensitization**

- 2-DODECENAL (HIGH TRANS) FCC 1 % Patch test, Vehicle Petrolatum.
  - Result: Not sensitizing.
  - Species: Human
  - Organ: Skin
  - Notes: RIFM
  - OECD 406
  - Result: Sensitization noted.
  - Species: Guinea pig
  - Notes: ECHA

**Germ cell mutagenicity**

- No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

**Germ cell mutagenicity: Ames test**

- 2-DODECENAL (HIGH TRANS) FCC 0.1 - 5000 µg/plate OECD 471, Strains TA 1535, TA 1537, TA 98, TA 100, and TA 102 with and without metabolic activation. Vehicle DMSO. Plate incorporation method.
  - Result: Not mutagenic.
  - Species: Salmonella typhimurium
  - Notes: RIFM
Germ cell mutagenicity: Ames test
2-DODECENAL (HIGH TRANS) FCC
0.3 - 1000 µg/plate OECD 471, Strains TA 1535, TA 1537, TA 98, TA 100, and TA 102 with and without metabolic activation. Vehicle DMSO. Preincubation method.
Result: Not mutagenic.
Species: Salmonella typhimurium
Notes: RIFM

Carcinogenicity
Not classifiable as to carcinogenicity to humans.

IARC Monographs. Overall Evaluation of Carcinogenicity
Not listed.

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

US. National Toxicology Program (NTP) Report on Carcinogens
Not listed.

Reproductive toxicity
This product is not expected to cause reproductive or developmental effects.

Specific target organ toxicity - single exposure
Not classified.

Specific target organ toxicity - repeated exposure
Not classified.

Aspiration hazard
Not an aspiration hazard.

Further information
May cause allergic respiratory and skin reactions.

12. Ecological information

Ecotoxicity
Very toxic to aquatic life.

<table>
<thead>
<tr>
<th>Product</th>
<th>Species</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-DODECENAL (HIGH TRANS) FCC (CAS 20407-84-5)</td>
<td>Daphnia</td>
<td>EC50 = 4.76 mg/l, 48 Hours OECD 202</td>
</tr>
<tr>
<td></td>
<td>Fish</td>
<td>LC50 = 0.718 mg/l, 96 Hours OECD 203</td>
</tr>
<tr>
<td></td>
<td>Algae</td>
<td>NOEC = &gt; 100 %, 72 Hours OECD 201</td>
</tr>
</tbody>
</table>

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

Persistence and degradability
The product is readily biodegradable.

Biodegradability
Percent degradation (Aerobic biodegradation-ready)
2-DODECENAL (HIGH TRANS) FCC
OECD 301F, 100 mg/L, 10-day criteria fulfilled.
Result: Readily biodegradable.
Species: Activated sludge of a predominantly domestic sewage

Bioaccumulative potential
Partition coefficient n-octanol / water (log Kow)
2-DODECENAL (HIGH TRANS) FCC

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
- UN number: UN3082
- UN proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (trans-2-Dodecen-1-al)
- Transport hazard class(es):
  - Class: 9
  - Subsidiary risk: -
  - Packing group: III
  - Environmental hazards: Yes
  - ERG Code: 9L
- Special precautions for user: Read safety instructions, SDS and emergency procedures before handling.
- Other information:
  - Passenger and cargo aircraft: Allowed with restrictions.
  - Cargo aircraft only: Allowed with restrictions.

IMDG
- UN number: UN3082
- UN proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (trans-2-Dodecen-1-al), MARINE POLLUTANT
- Transport hazard class(es):
  - Class: 9
  - Subsidiary risk: -
  - Packing group: III
  - Environmental hazards: Yes
  - Marine pollutant: Yes
  - EmS: F-A, S-F
- Special precautions for user: Read safety instructions, SDS and emergency procedures before handling.
- Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
- IATA; IMDG

Marine pollutant
15. Regulatory information

US federal regulations

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)

Hazard categories
Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

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>Yes</td>
</tr>
<tr>
<td>New Zealand</td>
<td>New Zealand Inventory</td>
<td>Yes</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>

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

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

Issue date 16-May-2015
Revision date 11-December-2019
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.

Disclaimer

Hazard(s) identification: Disposal
Hazard(s) identification: Response
Physical & Chemical Properties: Multiple Properties
Toxicological Information: Toxicological Property Data
GHS: Classification