SECTION 1: Identification

1.1. Identification

Product form: Substance
Substance name: Triethyl 2-fluoro-2-phosphonoacetate
CAS No: 2356-16-3
Product code: 6177-3-02*
Formula: C\textsubscript{8}H\textsubscript{16}FO\textsubscript{5}P
Synonyms: 2-Fluoro-2-phosphonoacetic acid triethyl ester; Diethyl[(ethoxycarbonyl)fluoromethyl]phosphonate; Ethyl diethylphosphonofluoroacetate

Other means of identification: MFCD00134400

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

Use of the substance/mixture: Laboratory chemicals
Manufacture of substances
Scientific research and development

1.3. Details of the supplier of the safety data sheet

SynQuest Laboratories, Inc.
P.O. Box 309
Alachua, FL 32615 - United States of America
T (386) 462-0788 - F (386) 462-7097
info@synquestlabs.com - www.synquestlabs.com

1.4. Emergency telephone number

Emergency number: (844) 523-4086 (3E Company - Account 10069)

SECTION 2: Hazard(s) Identification

2.1. Classification of the substance or mixture

Classification (GHS-US)
Flam. Liq. 4  H227 - Combustible liquid
Skin Irrit. 2  H315 - Causes skin irritation
Eye Irrit. 2A  H319 - Causes serious eye irritation
STOT SE 3  H335 - May cause respiratory irritation

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US): ![Hazard Pictogram]

Signal word (GHS-US): Warning

Hazard statements (GHS-US): H227 - Combustible liquid
H315 - Causes skin irritation
H319 - Causes serious eye irritation
H335 - May cause respiratory irritation

Precautionary statements (GHS-US): P210 - Keep away from heat/sparks/open flames/hot surfaces. No smoking
P261 - Avoid breathing fumes, mist, spray, vapors
P264 - Wash skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302+P352 - If on skin: Wash with plenty of soap and water
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P312 - Call a POISON CENTER or doctor/physician if you feel unwell
P321 - Specific treatment (see supplemental first aid instructions on this label)
P332+P337+P313 - If skin irritation occurs: Get medical advice/attention
P332+P337+P313 - If eye irritation persists: Get medical advice/attention
Triethyl 2-fluoro-2-phosphonoacetate
Safety Data Sheet
according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

P362+P364 - Take off contaminated clothing and wash it 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. Other hazards
No additional information available
2.4. Unknown acute toxicity (GHS US)
Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance
Substance type : Mono-constituent

<table>
<thead>
<tr>
<th>Name</th>
<th>Product identifier</th>
<th>%</th>
<th>Classification (GHS-US)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triethyl 2-fluoro-2-phosphonoacetate (Main constituent)</td>
<td>(CAS No) 2356-16-3</td>
<td>&lt;= 100</td>
<td>Flam. Liq. 4, H227</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Skin Irr. 2, H315</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Eye Irr. 2A, H319</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>STOT SE 3, H335</td>
</tr>
</tbody>
</table>

Full text of H-phrases: see section 16

3.2. Mixture
Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures
First-aid measures general : In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Move the affected personnel away from the contaminated area.
First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Get medical advice/attention.
First-aid measures after skin contact : Wash with plenty of soap and water. Get medical advice/attention.
First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical advice/attention.
First-aid measures after ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth out with water. Get medical advice/attention.

4.2. Most important symptoms and effects, both acute and delayed
Symptoms/injuries : 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
Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

5.2. Special hazards arising from the substance or mixture
Explosion hazard : Risk of explosion if heated under confinement. Use water spray or fog for cooling exposed containers. May form flammable/explosive vapor-air mixture.

5.3. Advice for firefighters
Firefighting instructions : In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion.
Protection during firefighting : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. For further information refer to section 8: "Exposure controls/personal protection".

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
General measures : Evacuate unnecessary personnel. Ensure adequate air ventilation. Do not breathe gas, fumes, vapor or spray.
6.1.1. For non-emergency personnel

Emergency procedures: Only qualified personnel equipped with suitable protective equipment may intervene.

6.1.2. For emergency responders

Protective equipment: Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

Emergency procedures: Gas/vapor heavier than air. May accumulate in confined spaces, particularly at or below ground level. Consider the risk of potentially explosive atmospheres. Eliminate every possible source of ignition.

6.2. Environmental precautions

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment: Stop leak if safe to do so. Dike for recovery or absorb with appropriate material.

Methods for cleaning up: Take up large spills with pump or vacuum and finish with dry chemical absorbent. Use explosion-proof equipment. Take up small spills with dry chemical absorbent. Sweep or shovel spills into appropriate container for disposal. Ventilate area.

Other information: For disposal of solid materials or residues refer to section 13: "Disposal considerations".

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Additional hazards when processed: Handle empty containers with care because residual vapors are flammable.

Precautions for safe handling: Do not handle until all safety precautions have been read and understood. Ensure good ventilation of the work station. Do not breathe fumes, mist, spray, vapors. Wear personal protective equipment. Avoid contact with skin and eyes. Keep away from ignition sources (including static discharges). Proper grounding procedures to avoid static electricity should be followed. Use only non-sparking tools.

Hygiene measures: Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures: Comply with applicable regulations.

Storage conditions: Keep container closed when not in use. Keep away from ignition sources.

Incompatible materials: Refer to Section 10 on Incompatible Materials.

Storage area: Store in dry, cool, well-ventilated area.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

8.2. Exposure controls

Appropriate engineering controls: Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.


Eye protection: Chemical goggles or safety glasses. Face shield. 29 CFR 1910.133: Eye and Face Protection.

Skin and body protection: Wear suitable protective clothing.


SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state: Liquid

Color: No data available

Odor: No data available

Odor threshold: No data available

pH: No data available
Triethyl 2-fluoro-2-phosphonoacetate
Safety Data Sheet
according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melting point</td>
<td>No data available</td>
</tr>
<tr>
<td>Freezing point</td>
<td>No data available</td>
</tr>
<tr>
<td>Boiling point</td>
<td>75 °C (@ 0.01 mmHg)</td>
</tr>
<tr>
<td>Flash point</td>
<td>73 °C</td>
</tr>
<tr>
<td>Relative evaporation rate (butyl acetate=1)</td>
<td>No data available</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>No data available</td>
</tr>
<tr>
<td>Explosion limits</td>
<td>No data available</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>No data available</td>
</tr>
<tr>
<td>Oxidizing properties</td>
<td>No data available</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>No data available</td>
</tr>
<tr>
<td>Relative density</td>
<td>No data available</td>
</tr>
<tr>
<td>Relative vapor density at 20 °C</td>
<td>No data available</td>
</tr>
<tr>
<td>Specific gravity / density</td>
<td>1.194 g/ml (@ 20 °C)</td>
</tr>
<tr>
<td>Molecular mass</td>
<td>242.18 g/mol</td>
</tr>
<tr>
<td>Solubility</td>
<td>No data available</td>
</tr>
<tr>
<td>Log Pow</td>
<td>No data available</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>Viscosity</td>
<td>No data available</td>
</tr>
<tr>
<td>Viscosity, kinematic</td>
<td>No data available</td>
</tr>
<tr>
<td>Viscosity, dynamic</td>
<td>No data available</td>
</tr>
<tr>
<td>9.2. Other information</td>
<td></td>
</tr>
<tr>
<td>Refractive index</td>
<td>1.425 (@ 20 °C)</td>
</tr>
</tbody>
</table>

**SECTION 10: Stability and reactivity**

10.1. Reactivity
No additional information available

10.2. Chemical stability
The product is stable at normal handling and storage conditions.

10.3. Possibility of hazardous reactions
No additional information available

10.4. Conditions to avoid
Keep away from heat, sparks and flame.

10.5. Incompatible materials
Strong oxidizing agents.

10.6. Hazardous decomposition products
Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

**SECTION 11: Toxicological information**

11.1. Information on toxicological effects

Acute toxicity                                  : Not classified
Skin corrosion/irritation                      : Causes skin irritation.
Serious eye damage/irritation                  : Causes serious eye irritation.
Respiratory or skin sensitization              : Not classified
Germ cell mutagenicity                         : Not classified
Carcinogenicity                                : Not classified
Reproductive toxicity                          : Not classified
Specific target organ toxicity (single exposure): May cause respiratory irritation.
Specific target organ toxicity (repeated exposure): Not classified
Triethyl 2-fluoro-2-phosphonoacetate
Safety Data Sheet
according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Aspiration hazard : Not classified

SECTION 12: Ecological information

12.1. Toxicity
No additional information available

12.2. Persistence and degradability
No additional information available

12.3. Bioaccumulative potential
No additional information available

12.4. Mobility in soil
No additional information available

12.5. Other adverse effects
No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods
Waste treatment methods : Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber.
Waste disposal recommendations : Dispose of contents/container in accordance with licensed collector’s sorting instructions.
Additional information : Recycle the material as far as possible.

SECTION 14: Transport information

Department of Transportation (DOT)
In accordance with DOT
Transport document description : NA1993 Combustible liquid, n.o.s., 3, III
UN-No.(DOT) : NA1993
Proper Shipping Name (DOT) : Combustible liquid, n.o.s.
Transport hazard class(es) (DOT) : 3 - Class 3 - Flammable and combustible liquid 49 CFR 173.120
Packing group (DOT) : III - Minor Danger
DOT Packaging Non Bulk (49 CFR 173.xxx) : 203
DOT Packaging Bulk (49 CFR 173.xxx) : 241
DOT Symbols : D - Proper shipping name for domestic use only, or to and from Canada,G - Identifies PSN requiring a technical name
DOT Special Provisions (49 CFR 172.102) : IB3 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1 and 31HA2, 31HB2, 31HN2, 31HD2 and 31HH2). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 °C (1.1 bar at 122 °F), or 130 kPa at 55 °C (1.3 bar at 131 °F) are authorized, except for UN2672 (also see Special Provision IP8 in Table 2 for UN2672).
T1 - 1.5 178.274(d)(2) Normal............. 178.275(d)(2)
T4 - 2.65 178.274(d)(2) Normal............. 178.275(d)(3)
TP1 - The maximum degree of filling must not exceed the degree of filling determined by the following: Degree of filling = 97 / (1 + a (tr - tf)) Where: tr is the maximum mean bulk temperature during transport, and tf is the temperature in degrees celsius of the liquid during filling.
DOT Packaging Exceptions (49 CFR 173.xxx) : 150
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 60 L
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 220 L
DOT Vessel Stowage Location : A - The material may be stowed “on deck” or “under deck” on a cargo vessel and on a passenger vessel.
Other information : No supplementary information available.

TDG
No additional information available
Transport by sea
No additional information available

Air transport
No additional information available

SECTION 15: Regulatory information

15.1. US Federal regulations
All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory except for:

| Triethyl 2-fluoro-2-phosphonoacetate | CAS No 2356-16-3 | 100% |

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

15.2. International regulations

CANADA
No additional information available

EU-Regulations
No additional information available

National regulations

| Triethyl 2-fluoro-2-phosphonoacetate (2356-16-3) |
| Listed on the Japanese ISHL (Industrial Safety and Health Law) |

15.3. US State regulations
California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

SECTION 16: Other information

Full text of H-phrases:

<table>
<thead>
<tr>
<th>Eye Irrit. 2A</th>
<th>Flam. Liq. 4</th>
<th>Skin Irrit. 2</th>
<th>STOT SE 3</th>
<th>H227</th>
<th>H315</th>
<th>H319</th>
<th>H335</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious eye damage/eye irritation Category 2A</td>
<td>Flammable liquids Category 4</td>
<td>Skin corrosion/irritation Category 2</td>
<td>Specific target organ toxicity (single exposure) Category 3</td>
<td>Combustible liquid</td>
<td>Causes skin irritation</td>
<td>Causes serious eye irritation</td>
<td>May cause respiratory irritation</td>
</tr>
</tbody>
</table>

NFPA health hazard
: 2 - Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical attention is given.

NFPA fire hazard
: 2 - Must be moderately heated or exposed to relatively high temperature before ignition can occur.

NFPA reactivity
: 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.

HMIS III Rating
Health
: 2 Moderate Hazard - Temporary or minor injury may occur
Flammability
: 2 Moderate Hazard - Materials which must be moderately heated or exposed to high ambient temperatures before ignition will occur. Includes liquids having a flash point at or above 100 F but below 200 F. (Classes II & IIIA)
Physical
: 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

SDS US (GHS HazCom 2012)
Triethyl 2-fluoro-2-phosphonoacetate
Safety Data Sheet

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is offered solely for your consideration, investigation, and verification. It does not represent any guarantee of the properties of the product nor that the hazard precautions or procedures described are the only ones which exist. SynQuest shall not be held liable or any damage resulting from handling or from contact with the above product.