Material Safety Data Sheet

acc. to OSHA and ANSI

Printing date 06/14/2004 Reviewed on 05/24/2004

1 Identification of substance:

○ Product details:

○ Product name: Triethyl orthoformate

○ Stock number: A13587

○ Manufacturer/Supplier:
  Alfa Aesar, A Johnson Matthey Company
  Johnson Matthey Catalog Company, Inc.
  30 Bond Street
  Ward Hill, MA 01835-8099
  Emergency Phone: (978) 521-6300
  CHEMTREC: (800) 424-9300
  Web Site: www.alfa.com

○ Information Department: Health, Safety and Environmental Department

○ Emergency information:
  During normal hours the Health, Safety and Environmental Department. After normal hours call Chemtrec at (800) 424-9300.

2 Composition/Data on components:

○ Chemical characterization:
    Description: (CAS#)

    Triethyl orthoformate (CAS# 122-51-0); 100%

○ Identification number(s):

○ EINECS Number: 204-550-4

3 Hazards identification

○ Hazard description: Xi Irritant

○ Information pertaining to particular dangers for man and environment
  R 10 Flammable.
  R 36/37/38 Irritating to eyes, respiratory system and skin.

○ Classification system

○ HMIS ratings (scale 0-4)

  (Hazardous Materials Identification System)
  Health (acute effects) = 1
Flammability = 1
Reactivity = 1

4 First aid measures

- **After inhalation**
  Supply fresh air. If required, provide artificial respiration.
  Keep patient warm.
  Seek immediate medical advice.
- **After skin contact**
  Immediately wash with water and soap and rinse thoroughly.
  Seek immediate medical advice.
- **After eye contact**
  Rinse opened eye for several minutes under running water. Then consult a doctor.
- **After swallowing** Seek immediate medical advice.

5 Fire fighting measures

- **Suitable extinguishing agents**
  CO2, sand, extinguishing powder. Do not use water.
- **For safety reasons unsuitable extinguishing agents** Water
- **Special hazards caused by the material, its products of combustion or resulting gases:**
  In case of fire, the following can be released:
  Carbon monoxide and carbon dioxide
- **Protective equipment:**
  Wear self-contained respirator.
  Wear fully protective impervious suit.

6 Accidental release measures

- **Person-related safety precautions:**
  Wear protective equipment. Keep unprotected persons away.
  Ensure adequate ventilation
  Keep away from ignition sources
- **Measures for environmental protection:**
  Do not allow material to be released to the environment without proper governmental permits.
- **Measures for cleaning/collecting:**
  Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
  Ensure adequate ventilation.
  Keep away from ignition sources.
- **Additional information:**
  See Section 7 for information on safe handling
  See Section 8 for information on personal protection equipment.
  See Section 13 for disposal information.

7 Handling and storage
Handling

Information for safe handling:
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.

Information about protection against explosions and fires:
Keep ignition sources away.
Protect against electrostatic charges.
Fumes can combine with air to form an explosive mixture.

Storage

Requirements to be met by storerooms and receptacles:
No special requirements.

Information about storage in one common storage facility:
Do not store together with oxidizing and acidic materials.
Store away from water/moisture.

Further information about storage conditions:
Protect from humidity and water.
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.

8 Exposure controls and personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Components with limit values that require monitoring at the workplace:
Not required.

Additional information: No data

Personal protective equipment

General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Avoid contact with the eyes and skin.

Breathing equipment:
Use suitable respirator when high concentrations are present.

Protection of hands: Impervious gloves

Eye protection: Safety glasses

Body protection: Protective work clothing.

9 Physical and chemical properties:

General Information
- Form: Liquid
- Color: Colorless
- Odor: Not determined

<table>
<thead>
<tr>
<th>Value/Range</th>
<th>Unit</th>
<th>Method</th>
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<tbody>
<tr>
<td>Melting point/Melting range:</td>
<td>-61 °C</td>
<td></td>
</tr>
<tr>
<td>Boiling point/Boiling range:</td>
<td>143-147 °C</td>
<td></td>
</tr>
<tr>
<td>Sublimation temperature / start:</td>
<td>Not determined</td>
<td></td>
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</tbody>
</table>

- Flash point: Not applicable
- Ignition temperature: Not determined
- Decomposition temperature: Not determined
- Explosion limits:
  - Lower: Not determined
  - Upper: Not determined
- Vapor pressure: Not determined
- Density: at 20 °C 0.89 g/cm³
- Solubility in / Miscibility with
  - Water: Not determined

10 Stability and reactivity

- Thermal decomposition / conditions to be avoided:
  Decomposition will not occur if used and stored according to specifications.
- Materials to be avoided:
  - Oxidizing agents
  - Acids
  - Water/moisture
- Dangerous reactions No dangerous reactions known
- Dangerous products of decomposition: Carbon monoxide and carbon dioxide

11 Toxicological information

- Acute toxicity:
  - LD/LC50 values that are relevant for classification:
    - Oral: LD50: 7060 mg/kg (rat)
    - Dermal: LD50: >10 mL/kg (gpg)
    - LD50: 20 mL/kg (rct)
    - Inhalative: LCLo/8H: 4000 ppm/8H (rat)
Irritation of skin: mild: 500 mg/24H (rbt)
Irritation of eyes: moderate: 100 mg/24H (rbt)

- **Primary irritant effect:**
  - on the skin: Irritant to skin and mucous membranes.
  - on the eye: Irritating effect.
  - Sensitization: No sensitizing effects known.

- **Subacute to chronic toxicity:**
  Other than potential irritation (see above), no information on
  illness or injury to humans from acute or chronic exposure to
  this product is available.

- **Additional toxicological information:**
  To the best of our knowledge the acute and chronic toxicity of
  this substance is not fully known.
  No classification data on carcinogenic properties of this
  material is available from the EPA, IARC, NTP, OSHA or ACGIH.

- **12 Ecological information:**
  - General notes:
    Do not allow material to be released to the environment without
    proper governmental permits.

- **13 Disposal considerations**
  - **Product:**
    - **Recommendation**
      Consult state, local or national regulations to ensure proper
      disposal.

  - **Uncleaned packagings:**
    - **Recommendation:**
      Disposal must be made according to official regulations.

- **14 Transport information**
  - **DOT regulations:**
    - **Hazard class:** 3
    - **Identification number:** UN2524
    - **Packing group:** III
    - **Proper shipping name (technical name):**
      Ethyl orthoformate

    - **Land transport ADR/RID (cross-border):**
      - **ADR/RID class:** 3 Flammable liquids
      - **Item:** 31c
      - **Danger code (Kemler):** 30
      - **UN-Number:** 2524
      - **Description of goods:** Ethyl orthoformate
Maritime transport IMDG:
- IMDG Class: 3
- UN Number: 2524
- Packaging group: III
- Proper shipping name: Ethyl orthoformate

Air transport ICAO-TI and IATA-DGR:
- ICAO/IATA Class: 3
- UN/ID Number: 2524
- Packaging group: III
- Proper shipping name: Ethyl orthoformate

15 Regulations

Product related hazard informations:

- Hazard symbols: Xi Irritant

- Risk phrases:
  10 Flammable.
  36/37/38 Irritating to eyes, respiratory system and skin.

- Safety phrases:
  26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
  37 Wear suitable gloves.
  60 This material and its container must be disposed of as hazardous waste.

National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.

Information about limitation of use:
For use only by technically qualified individuals.

16 Other information:

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing MSDS: Health, Safety and Environmental Department.
- Contact: Darrell R. Sanders