Material Safety Data Sheet
acc. to OSHA and ANSI
Printing date 08/13/2004 Reviewed on 07/20/2004

1 Identification of substance:
   ○ Product details:
     ○ Product name: Trimethyl orthoformate
     ○ Stock number: A13760
     ○ 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#)
     Trimethyl orthoformate (CAS# 149-73-5); 100%
     ○ Identification number(s):
     ○ EINECS Number: 205-745-7

3 Hazards identification
   ○ Hazard description:
     Xi Irritant
     F Highly flammable
   ○ Information pertaining to particular dangers for man and environment
     R 11 Highly 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 = 3
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:
    Reacts with water to form methanol, which is toxic and flammable.
    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:**
    - Store in a cool location.
  - **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>Property</th>
<th>Value/Range</th>
<th>Unit</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in condition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melting point/Melting range:</td>
<td>-53 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boiling point/Boiling range:</td>
<td>101-102 °C</td>
<td></td>
<td></td>
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<tr>
<td>Sublimation temperature / start:</td>
<td>Not determined</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flash point:</td>
<td>13 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition temperature:</td>
<td>Not determined</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decomposition temperature:</td>
<td>Not determined</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Danger of explosion:</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Product is not explosive. However, formation of explosive air/vapor mixtures is possible.</td>
<td></td>
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<tr>
<td>Explosion limits:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower:</td>
<td>1.4 Vol %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper:</td>
<td>5.1 Vol %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vapor pressure:</td>
<td>at 30 °C</td>
<td>53.2</td>
<td>hPa</td>
</tr>
<tr>
<td>Density:</td>
<td>at 20 °C</td>
<td>0.970</td>
<td>g/cm³</td>
</tr>
<tr>
<td>Solubility in / Miscibility with</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water:</td>
<td>Hydrolyzes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not determined</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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:
  Acids
  Oxidizing agents
  Water/moisture
- Dangerous reactions
  Easily hydrolyzes to form methanol which is toxic, flammable, and can cause permanent blindness of the eye.
- Dangerous products of decomposition:
  Methanol
Carbon monoxide and carbon dioxide

11 Toxicological information

- Acute toxicity:
  - LD/LC50 values that are relevant for classification:
    - 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 packaging:
    - Recommendation:
      - Disposal must be made according to official regulations.

14 Transport information

- DOT regulations:
  - Hazard class: 3
  - Identification number: UN3272
  - Packing group: II
  - Proper shipping name (technical name):
    - Esters, n.o.s., trimethyl orthoformate
- Land transport ADR/RID (cross-border)
  - ADR/RID class: 3 Flammable liquids
  - Item: 3b
  - Danger code (Kemler): 33
  - UN-Number: 3272
  - Description of goods: Esters, n.o.s., trimethyl orthoformate

- Maritime transport IMDG:
  - IMDG Class: 3
  - UN Number: 3272
  - Packaging group: II
  - Proper shipping name: Esters, n.o.s., trimethyl orthoformate

- Air transport ICAO-TI and IATA-DGR:
  - ICAO/IATA Class: 3
  - UN/ID Number: 3272
  - Packaging group: II
  - Proper shipping name: Esters, n.o.s., trimethyl orthoformate

- 15 Regulations

  - Product related hazard informations:

  - Hazard symbols:
    Xi Irritant F Highly flammable

  - Risk phrases:
    11 Highly 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