SAFETY DATA SHEET

According to JIS Z 7253:2012
Revision Date 26-Dec-2019
Version 6.01

Section 1: PRODUCT AND COMPANY IDENTIFICATION

<table>
<thead>
<tr>
<th>Product name</th>
<th>Tetraethyl Orthosilicate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product code</td>
<td>053-03476</td>
</tr>
<tr>
<td>CAS RN</td>
<td>78-10-4</td>
</tr>
<tr>
<td>Formula</td>
<td>(C2H5O)4Si</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>FUJIFILM Wako Pure Chemical Corporation</td>
</tr>
<tr>
<td></td>
<td>1-2 Doshomachi 3-Chome</td>
</tr>
<tr>
<td></td>
<td>Chuo-ku, Osaka 540-8605, Japan</td>
</tr>
<tr>
<td></td>
<td>Phone: +81-6-6203-3741</td>
</tr>
<tr>
<td></td>
<td>Fax: +81-6-6203-5964</td>
</tr>
<tr>
<td>Supplier</td>
<td>FUJIFILM Wako Pure Chemical Corporation</td>
</tr>
<tr>
<td></td>
<td>1-2 Doshomachi 3-Chome, Chuo-ku, Osaka 540-8605, Japan</td>
</tr>
<tr>
<td></td>
<td>Phone: +81-6-6203-3741</td>
</tr>
<tr>
<td></td>
<td>Fax: +81-6-6203-2029</td>
</tr>
<tr>
<td>Emergency telephone number</td>
<td>+81-6-6203-3741 / +81-3-3270-8571</td>
</tr>
<tr>
<td>Recommended uses and restrictions on use</td>
<td>For research purposes</td>
</tr>
</tbody>
</table>

Section 2: HAZARDS IDENTIFICATION

GHS classification
Classification of the substance or mixture
- Flammable liquids: Category 3
- Skin corrosion/irritation: Category 2
- Serious eye damage/eye irritation: Category 2A
- Specific target organ toxicity (single exposure):
  - Category 1: blood system
  - Category 3: respiratory tract irritation, Narcotic effects
- Specific target organ toxicity (repeated exposure):
  - Category 1: respiratory system
  - Category 2: kidneys

Pictograms:
- Flammable liquid and vapor
- Skin corrosion/irritation
- Eye irritation

Signal word: Danger

Hazard statements
- H226 - Flammable liquid and vapor
- H315 - Causes skin irritation
- H319 - Causes serious eye irritation
- H335 - May cause respiratory irritation
- H336 - May cause drowsiness or dizziness
- H370 - Causes damage to the following organs: blood system
- H372 - Causes damage to the following organs through prolonged or repeated exposure: respiratory system
- H373 - May cause damage to the following organs through prolonged or repeated exposure: kidneys
Precautionary statements-(Prevention)
- Wash face, hands and any exposed skin thoroughly after handling
- Wear protective gloves/protective clothing/eye protection/face protection
- Do not breathe dust/fume/gas/mist/vapors/spray
- Do not eat, drink or smoke when using this product
- Use only outdoors or in a well-ventilated area
- Keep away from heat/sparks/open flames/hot surfaces. — No smoking
- Keep container tightly closed
- Ground/bond container and receiving equipment
- Use explosion-proof electrical/ventilating/lighting/equipment
- Use only non-sparking tools
- Take precautionary measures against static discharge
- Keep cool

Precautionary statements-(Response)
- IF exposed: Call a POISON CENTER or doctor/physician
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If eye irritation persists: Get medical advice/attention.
- If skin irritation occurs: Get medical advice/attention
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- Wash contaminated clothing before reuse.
- IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- In case of fire: Use CO2, dry chemical, or foam for extinction

Precautionary statements-(Storage)
- Store locked up.
- Store in a well-ventilated place. Keep container tightly closed

Precautionary statements-(Disposal)
- Dispose of contents/container to an approved waste disposal plant

Others
Other hazards
Not available

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

Single Substance or Mixture
Substance

Formula
(C2H5O)4Si

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Weight-%</th>
<th>Molecular weight</th>
<th>ENCS</th>
<th>ISHL No.</th>
<th>CAS RN</th>
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</thead>
<tbody>
<tr>
<td>Tetraethyl Orthosilicate</td>
<td>95.0</td>
<td>208.33</td>
<td>(2)-2048</td>
<td>2-(3)-215</td>
<td>78-10-4</td>
</tr>
</tbody>
</table>

Impurities and/or Additives
Not applicable

Section 4: FIRST AID MEASURES

Inhalation
Remove to fresh air. If symptoms persist, call a physician.

Skin contact
Wash off immediately with soap and plenty of water. If symptoms persist, call a physician.

Eye contact
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediate medical attention is required.

Ingestion
Rinse mouth. Never give anything by mouth to an unconscious person. Call a physician or poison control center immediately. Do not induce vomiting without medical advice.

Protection of first-aiders
Use personal protective equipment as required.
Section 5: FIRE FIGHTING MEASURES

Suitable extinguishing media
Water spray (fog), Carbon dioxide (CO2), Foam, Extinguishing powder, Sand

Unsuitable extinguishing media
No information available

Special extinguishing method
No information available

Specific hazards arising from the chemical product
Thermal decomposition can lead to release of irritating and toxic gases and vapors. Vapors may form explosive mixtures with air

Protection of fire-fighters
Use personal protective equipment as required. Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures
For indoor, provide adequate ventilation process until the end of working. Deny unnecessary entry other than the people involved by, for example, using a rope. While working, wear appropriate protective equipments to avoid adhering it on skin, or inhaling the gas. Work from windward, and retract the people downwind.

Environmental precautions
To be careful not discharged to the environment without being properly handled waste water contaminated.

Methods and materials for contaminant and methods and materials for cleaning up
Absorb dry sand, earth, sawdust and the waste. Collect empty container that can be sealed.

Recovery, neutralization
No information available

Secondary disaster prevention measures
Clean contaminated objects and areas thoroughly observing environmental regulations.

Section 7: HANDLING AND STORAGE

Handling
Technical measures
Highly flammable. Avoid contact with high temperature objects, spark, and strong oxidizing agents. Use with local exhaust ventilation.

Precautions
Do not rough handling containers, such as upsetting, falling, giving a shock, and dragging. Prevent leakage, overflow, and scattering. Not to generate steam and dust in vain. Seal the container after use. After handling, wash hands and face, and then gargle. In places other than those specified, should not be smoking or eating and drinking. Should not be brought contaminated protective equipment and gloves to rest stops. Deny unnecessary entry of non-emergency personnel to the handling area.

Safety handling precautions
Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapors). Use personal protective equipment as required. Avoid contact with skin, eyes or clothing.

Storage
Safe storage conditions
Store away from sunlight in well-ventilated place at room temperature (preferably cool).

Storage conditions
Keep container tightly closed.

Safe packaging material
Glass

Incompatible substances
Strong oxidizing agents

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering controls
In case of indoor workplace, seal the source or use a local exhaust system. Provide the safety shower facility, and hand- and eye-wash facility. And display their position clearly.
**Exposure limits**

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>JSOH (Japan)</th>
<th>ISHL (Japan)</th>
<th>ACGIH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetraethyl Orthosilicate 78-10-4</td>
<td>TWA: 10 ppm OEL TWA: 85 mg/m³ OEL</td>
<td>N/A</td>
<td>TWA: 10 ppm</td>
</tr>
</tbody>
</table>

**Personal protective equipment**
- **Respiratory protection**
  - Gas mask for organic gas
- **Hand protection**
  - Impermeable protective gloves
- **Eye protection**
  - Protective eyeglasses or chemical safety goggles
- **Skin and body protection**
  - Long-sleeved work clothes

**General hygiene considerations**
Handle in accordance with good industrial hygiene and safety practice.

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**Section 9: PHYSICAL AND CHEMICAL PROPERTIES**

**Form**
- **Color**
  - Colorless - nearly colorless
- **Turbidity**
  - Clear
- **Appearance**
  - Liquid
- **Odor**
  - Characteristic odor
- **pH**
  - No data available
- **Melting point/freezing point**
  - -77 °C
- **Boiling point, initial boiling point and boiling range**
  - 165 °C
- **Flash point**
  - 54 °C
- **Evaporation rate:**
  - No data available
- **Flammability (solid, gas):**
  - No data available
- **Upper/lower flammability or explosive limits**
  - Upper: 23%
  - Lower: 1.3%
- **Vapour pressure**
  - No data available
- **Vapour density**
  - 7.22 (air=1)
- **Specific Gravity / Relative density**
  - 0.932 - 0.940 g/mL
- **Solubilities**
  - Water: practically insoluble or insoluble. Ethanol: soluble.
- **n-Octanol/water partition coefficient:(log Pow)**
  - 0.04
- **Auto-ignition temperature:**
  - 230 °C
- **Decomposition temperature:**
  - No data available
- **Viscosity (coefficient of viscosity)**
  - No data available
- **Dynamic viscosity**
  - No data available

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**Section 10: STABILITY AND REACTIVITY**

**Stability**
- **Decomposed by the absorption of moisture.**
- **No data available**

**Hazardous reactions**
None under normal processing

**Conditions to avoid**
- Extremes of temperature and direct sunlight, Heat, flames and sparks, static electricity, spark, Moisture

**Incompatible materials**
- Strong oxidizing agents

**Hazardous decomposition products**
- Carbon monoxide (CO), Carbon dioxide (CO2).

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**Section 11: TOXICOLOGICAL INFORMATION**

**Acute toxicity**

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Oral LD50 (mg/kg) (Rat)</th>
<th>Dermal LD50 (mg/kg) (Rabbit)</th>
<th>Inhalation LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetraethyl Orthosilicate</td>
<td>6270</td>
<td>5859</td>
<td>N/A</td>
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<tr>
<td>Chemical Name</td>
<td>Acute toxicity -oral- source information</td>
<td>Acute toxicity -dermal- source information</td>
<td>Acute toxicity -inhalation gas-source information</td>
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<tr>
<td>----------------------</td>
<td>------------------------------------------</td>
<td>---------------------------------------------</td>
<td>---------------------------------------------------</td>
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<tr>
<td>Tetraethyl Orthosilicate</td>
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<td>Based on the NITE GHS classification results.</td>
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</table>

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Acute toxicity -inhalation vapor-source information</th>
<th>Acute toxicity -inhalation dust-source information</th>
<th>Acute toxicity -inhalation mist-source information</th>
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<tbody>
<tr>
<td>Tetraethyl Orthosilicate</td>
<td>Based on the NITE GHS classification results.</td>
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</table>

### Skin irritation/corrosion
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Skin corrosion irritation source information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetraethyl Orthosilicate</td>
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</table>

### Serious eye damage/irritation
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Serious eye damage source information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetraethyl Orthosilicate</td>
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### Respiratory or skin sensitization
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Respiratory, Skin sensitization source information</th>
</tr>
</thead>
<tbody>
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<td>Tetraethyl Orthosilicate</td>
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</table>

### Reproductive cell mutagenicity
<table>
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<tr>
<th>Chemical Name</th>
<th>Mutagenic source information</th>
</tr>
</thead>
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<tr>
<td>Tetraethyl Orthosilicate</td>
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### Carcinogenicity
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Carcinogenicity source information</th>
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</thead>
<tbody>
<tr>
<td>Tetraethyl Orthosilicate</td>
<td>Based on the NITE GHS classification results.</td>
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### Reproductive toxicity
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Reproductive toxicity source information</th>
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<tbody>
<tr>
<td>Tetraethyl Orthosilicate</td>
<td>Based on the NITE GHS classification results.</td>
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</table>

### STOT-single exposure
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>STOT -single exposure- source information</th>
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<tbody>
<tr>
<td>Tetraethyl Orthosilicate</td>
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</table>

### STOT-repeated exposure
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>STOT -repeated exposure- source information</th>
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<tr>
<td>Tetraethyl Orthosilicate</td>
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### Aspiration hazard
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Aspiration Hazard source information</th>
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</thead>
<tbody>
<tr>
<td>Tetraethyl Orthosilicate</td>
<td>Based on the NITE GHS classification results.</td>
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### Section 12: ECOLOGICAL INFORMATION

#### Ecotoxicity

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Algae/aquatic plants</th>
<th>Fish</th>
<th>Crustacea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetraethyl Orthosilicate</td>
<td>ErC50 &gt; Pseudokirchneriella subcapitata 100 mg / l 72 h</td>
<td>LC50 : Oryzias latipes 245 mg / l 96h</td>
<td>EC50 &gt; Daphnia magna 75 mg / l 48 h</td>
</tr>
</tbody>
</table>

#### Other data
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Aquatic toxicity -Acute- source information</th>
<th>Aquatic toxicity -Chronic- source information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetraethyl Orthosilicate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Persistence and degradability
- No information available

#### Bioaccumulative potential
- No information available

#### Mobility in soil
- No information available

#### Hazard to the ozone layer
- No information available

### Section 13: DISPOSAL CONSIDERATIONS
Waste from residues
Disposal should be in accordance with applicable regional, national and local laws and regulations.

**Contaminated container and contaminated packaging**
Disposal should be in accordance with applicable regional, national and local laws and regulations.

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### Section 14: TRANSPORT INFORMATION

<table>
<thead>
<tr>
<th>ADR/RID</th>
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<tr>
<td>UN number</td>
<td>UN1292</td>
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<tr>
<td>Proper shipping name</td>
<td>Tetraethyl silicate</td>
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<tr>
<td>UN classification</td>
<td>3</td>
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<tr>
<td>Subsidiary hazard class</td>
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<tr>
<td>Packing group</td>
<td>III</td>
</tr>
<tr>
<td>Marine pollutant</td>
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</tr>
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</table>

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>UN number</td>
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<td>3</td>
</tr>
<tr>
<td>Subsidiary hazard class</td>
<td></td>
</tr>
<tr>
<td>Packing group</td>
<td>III</td>
</tr>
<tr>
<td>Marine pollutant (Sea)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code</td>
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<table>
<thead>
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<tbody>
<tr>
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<tr>
<td>Proper shipping name</td>
<td>Tetraethyl silicate</td>
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<tr>
<td>UN classification</td>
<td>3</td>
</tr>
<tr>
<td>Subsidiary hazard class</td>
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</tr>
<tr>
<td>Packing group</td>
<td>III</td>
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<tr>
<td>Environmentally Hazardous Substance</td>
<td>Not applicable</td>
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</tbody>
</table>

### Section 15: REGULATORY INFORMATION

#### International Inventories
- EINECS/ELINCS: Listed
- TSCA: Listed

#### Japanese regulations
- **Fire Service Act**: Category IV, Class II petroleums, dangerous grade 3
- **Poisonous and Deleterious Substances Control Law**: Not applicable
- **Industrial Safety and Health Act**: Notifiable Substances (Law Art.57-2, Enforcement Oder Art.18-2 Attached Table No.9 No.356)
  - Dangerous Substances - Flammable Substance (Enforcement Order Attached Table 1 Item 4)
  - Harmful Substances Whose Names Are to be Indicated on the Label (Law Art.57, Para.1, Enforcement Order Art.18)
- **Regulations for the carriage and storage of dangerous goods in ship**: Flammable Liquids (Ordinance Art.3, Ministry of Transportation Ordinance Regarding Transport by Ship and Storage, Attached Table 1)
- **Civil Aeronautics Law**: Flammable Liquids (Ordinance Art.194, MITL Nortification for Air Transportation of Explosives etc., Attached Table 1)
- **Marine Pollution Prevention Law**: Enforcement ordinance Appendix No. 1 Noxious liquid substance Category Z
- **Pollutant Release and Transfer Register Law**: Not applicable

**Export Trade Control Order**: Not applicable

### Section 16: OTHER INFORMATION
Key literature references and sources for data etc.

NITE: National Institute of Technology and Evaluation (JAPAN)
http://www.safe.nite.go.jp/japan/db.html
IATA dangerous Goods Regulations
RTECS: Registry of Toxic Effects of Chemical Substances
Japan Industrial Safety and Health Association GHS Model SDS
Dictionary of Synthetic Organic Chemistry, SSOJC, Koudansha Scientific Co.Ltd.
Chemical Dictionary, Kyouritsu Publishing Co., Ltd.
etc

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.
GHS Classification is according to JIS Z7252(2014). *JIS: Japanese Industrial Standards

End of Safety Data Sheet