1. Identification of the Substance/Mixture and the Supplier

Supplier : National Institute of Advanced Industrial Science and Technology (AIST)

Address : 1-3-1, Kasumigaseki, Chiyoda, Tokyo, Japan

Office in Charge : Reference Materials Office, Center for Quality Management of Metrology, National Metrology Institute of Japan

Person in Charge : Certified Reference Material Staff

Telephone No. : +81-29-861-4059  Fax No. : +81-29-861-4009

Emergency Contact : Same as above

Prepared on : August 29, 2007  Revised on : March 31, 2017  ID Number : 8004001

Identity of Substance/Mixture : Certified reference material: NMIJ CRM 8004-a

Recommended Use of the Chemical and Restriction on Use : This CRM is intended for use in controlling the precision of analysis or to confirmation on the validity of analytical methods or instruments during the quantitative determination of main constituents and trace elements in silicon nitride. Do not use this reference material for other purposes than testing/research.

2. Hazards Identification

GHS Classification : Acute toxic (if inhaled dust mist.) : Class 5

GHS Label Element : N/A

Signal Word : Warning

Hazard Statement : Toxic, if inhaled. (dust)

Other Hazards Statement : If silicon oxide, an impurity contained in this reference material, enters lungs, it will get gathered in lymph tissue, bronchi, blood vessel, etc. and will penetrate into pulmonary alveoli to cause chronic bronchitis, rheumatic disorder, coccus pneumonia, etc.

Precautionary Statement : [Precaution]

- Do not eat, drink or smoke when using this product.
- Get the instruction manual before use. Do not handle until all safety precautions have been read and understood.
- Wash hands thoroughly after handling.
- Use personal protective equipment if necessary.
- Do not breathe dust, mist, vapors, etc.

[Action]
If inhaled, get medical advice/attention if you feel unwell.
If exposed: Get medical advice/attention.

[Storage]
Keep out direct sunlight and high relative humidity. Store this CRM in a clean place at normal room temperature.

[Disposal]
Dispose of this reference material in accordance with applicable legislation and local government ordinance.
Entrust disposal of this reference material to a professional waste disposal company licensed by prefectural governor.

The other hazards than the above do not result in classification or are not classifiable.

3. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>Substance or Mixture</th>
<th>Mixture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical name</td>
<td>Silicon nitride</td>
</tr>
<tr>
<td>Other name</td>
<td></td>
</tr>
<tr>
<td>Chemical or structural</td>
<td>Si₃N₄</td>
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<tr>
<td>Molecular weight</td>
<td>140.28</td>
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<tr>
<td>CAS No.</td>
<td>12033-89-5</td>
</tr>
<tr>
<td>Content</td>
<td>97.7 % or more</td>
</tr>
<tr>
<td>Reference Number in</td>
<td>Act on the Evaluation of Chemical Substances and Regulation</td>
</tr>
<tr>
<td>Gazetted List in Japan</td>
<td>of Their Manufacture, etc.</td>
</tr>
<tr>
<td></td>
<td>(1)−493</td>
</tr>
<tr>
<td></td>
<td>Industrial Safety and Health Act: Published</td>
</tr>
</tbody>
</table>

This CRM contains minor elements shown below:
Al, Ca, Fe, Mg, Mn, Ni, Ti, Zr, Ba, Co, Cr, Cu, Mo, Sr, Y, O, F.

Hazardous substance : Silicon oxide contained in Silicon nitride

4. First-aid Measures

If in Eyes : Rinse cautiously with clean water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical advice/attention immediately.

If on Skin : Remove/Take off contaminated clothing, etc. Rinse thoroughly with clean water. Wash polluted clothing, if reuse them.

If on Skin : Remove/Take off contaminated clothing, etc. Rinse thoroughly with clean water. Wash polluted clothing, if reuse them.

If Ingested : Rinse mouth thoroughly with water. Drink a lot of water then it induces vomiting. Immediately call a physician. Do not make victim take anything orally if unconscious.

Predicted immediate and delayed symptoms : -
Most important symptom/effect: -
Protecting Personnel in emergency measures: Use personal protective equipment.

5. Fire-fighting Measures

Extinguishing Media: Fire extinguishing agents for general purpose.
This CRM has the potential to generate ammonia gas with hydrolysis occurs on contact with water at elevated temperature.
At high temperatures, it is when irrigation or watering to a large amount of product it is necessary to pay attention. Therefore, in high temperature, and when irrigation or watering to a large amount of product it is necessary to pay attention.

Non-flammable

Specific Fire-fighting Method: Eliminate ignition sources at the origin of a fire and put out fire by using extinguishing media. Remove movable containers promptly to a safe place. In the case of immovable containers, cool their surroundings with sprayed water.

Protection of Fire-Fighters: Carry out fire-fighting from the windward in order to avoid breathing hazardous gas (ammonia). Use personal protective equipment such as fire protection clothing, heat-resistant clothing, protective clothing, breathing apparatus, circulating oxygen respirator, rubber gloves, and rubber boots.

6. Accidental Release Measures

Personal Precaution: Use appropriate personal protective equipment during the operation to avoid contact with skin, eyes, and clothes.

Personal Protective Equipment and Emergency Procedures: When accidental release takes place in hot water, it may release toxic gas. Therefore thoroughly clear the air until the emergency measures are complete. Before the operation, wear appropriate protective equipment to protect skin from droplets and to prevent inhalation of dust and gas.

Environmental Precautions: Take precautions to prevent spillage from draining into rivers etc. to adversely impact the environment. Make it sure to appropriately treat contaminated wastewater in order to prevent untreated wastewater from being released into the surrounding environment.

Prevention of Recovery and Neutralization: Collect spillage in empty containers by getting it adsorbed to wiping cloth, rag or earth and sand, etc.

Mark the restricted area with rope etc. to keep out unauthorized
Secondary Disaster people. Carry out the clean-up operation from the windward and make people on the leeward side evacuate.

7. Handling and Storage

Handling Engineering Precautions: Use appropriate personal protective equipment to avoid inhalation and contact with eyes and skin.

Local and General Ventilation Precautions: When vapor or mist is generated, seal the source, and provide local exhaust ventilation or central ventilation.

Precautions for Safe Handling: Avoid rough handling such as turning over, dropping, giving a shock to or dragging containers. Prevent spill, overflow and scattering, and avoid vapor generation. Keep container tightly closed after using this reference material. Wash hands, face etc. thoroughly and gargle after handling this reference material. Restrict drinking, eating and smoking to a designated area. Do not bring gloves and other contaminated personal protective equipment into staff room. Make a place handling this reference material a restricted area to keep out unauthorized people. Use appropriate personal protective equipment to avoid inhalation and contact with eyes, skin and clothing. Use local ventilation system in indoor handling areas. Avoid contact with water.

Storage

Appropriate Storage Conditions: Keep out of sunlight, high temperature and humidity. Store in clean place at normal room temperature.

Safe Container Packaging Material: Glass

8. Exposure Controls/Personal Protection

Threshold Limit Value

- Not specified

Permissible Concentration (Silicon nitride)
- ACGIH TLV-TWA (2003): 10 mg/m$^3$ (total dust), 3 mg/m$^3$ (respirable fraction)
- Values recommended by Japan Society for Occupational Health (2003): Class 3 dust: 8 mg/m$^3$ (total dust), 2 mg/m$^3$ (respirable fraction)

Permissible Concentration (Amorphous silica)
- ACGIH TLV-TWA (2003): fume: 2.0 mg/m$^3$, fused: 0.1 mg/m$^3$
- Values recommended: Class 2 dust: 4 mg/m$^3$ (total dust),
by Japan Society for Occupational Health (2003)

- OSHA PEL TWA: 20 mppcf, 0.8 mg/m³

Facility engineering

- Ventilation, exhaust: When there is a risk of exceeding the above allowable concentration, wear personal protective equipment and install local ventilation system. Local exhaust is recommended to be used in conjunction with the general ventilation. It is desirable to confirm that the atmospheric conditions in the workplace are less than the allowable concentrations using appropriate measuring instruments.

- Safety management/gas detector

- Storing precaution: Ventilate along floor surface. Seal.

Personal Protective equipment
- Respiratory protection: Protective dust mask, if necessary
- Hands: Protective gloves
- Eyes: Eye protector (Goggle type as necessary)
- Skin and Body: Protective clothing

Hygiene measure
Treat in accordance with rules on Industrial hygiene and Industrial safety.

9. Physical and Chemical Properties

- Appearance, etc.: Fine powder
- Color: White
- Odor: No data
- pH: 8~10
- Melting point: No data
- Boiling point: Silicon nitride (sublimation at about 1900 °C)
  Amorphous silica 2230 °C
- Flashing point: No data
- Explosive range: No data
- Vapor pressure: No data
- Relative vapor density (Air=1): No data
- Specific gravity or bulk specific gravity: 3.18 g/cm³
- Solubility: Insoluble in water.
- Octanol/water partition coefficient (Log Po/w): No data
- Auto-ignition temperature: No data

10. Stability and Reactivity
11. Toxicological Information

Acute Toxicity (Amorphous silica)
- Intravenous Rat LD50 = 15 mg/kg
- Oral Rat LD50 = 3160 mg/kg
- Oral Mouse LD50 = 9 mg/kg
- Oral Rabbit LD50 = 35 mg/kg

Other
- When mixed with water, there is a case ammonia is slightly raised. Ammonia gas has a pungent odor, it is a strong stimulation and corrosive to the skin, mucous membranes.

12. Ecological Information

Degradability, concentration
- This substance is chemically stable. Attention should be paid to the possibility of a scattering of dust or a suspension in the air.

Bioaccumulative Potential
- No data

Ecotoxicity
- No data

13. Disposal Considerations

- Dispose of this reference material in accordance with applicable legislation and local government ordinance.
- When the above-mentioned treatments are not possible, entrust disposal of residual waste to a professional waste disposal company licensed by prefectural governor.
- Dispose of containers after thoroughly removing their contents.

14. Transport Information

UN Number : N/A
UN Classification : N/A

NMIJ CRM 8004-a
Material name : -
Container grade : -
Marine pollutant : -
Precautions : Avoid direct sunlight and transfer with care not to spill/leak by dropping or falling, etc.

15. Regulatory Information
   - No applicable laws and regulations

16. Other Information
   Others
   The information in this document is not intended to be exhaustive and is based on currently available information and data. The measures given in this document are applicable only to normal handling conditions. When handling this reference material under special conditions etc., it is recommended to take safety measures appropriate to each specific application and context of use. This document is intended to provide information and not intended to guarantee anything in handling this reference material.