

Safety Data Sheet



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 : November 22, 2010
Revised on : December 14, 2021
ID Number : 5803001-1

Identity of Substance/Mixture : Certified reference material: NMIJ CRM 5803-a (Shape 1)
Single-Crystal of Silicon for Thermal Expansivity Measurements (at Cryogenic Temperature)

Recommended Use of the Chemical and Restriction on Use : This CRM is intended for use in the calibration of push-rod dilatometers and thermomechanical analyzers or as a reference specimen in thermal expansion measurements. Do not use this reference material for other purposes than testing/research.

2. Hazards Identification

GHS classification : Not classifiable

GHS Label Element : Not assigned

Signal Word : —

Hazard and toxicity : Flammable solid (in the case of powder form)

Other Hazards : Harmful if swallowed

Statement : Causes irritation if in eyes or if in contact with mucous membrane
May cause such symptoms as discomfort, nausea and headache through prolonged exposure

Precautionary Statement : [Precaution]
Use appropriate personal protective equipment.
[Action]
If in eyes: Rinse with running water for several minutes. Get medical advice/attention.
[Storage]
This CRM is recommended to be stored at 23 °C ±5 °C and relative humidity less than 50 %, and under a nitrogen gas atmosphere.
[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

Substance/Mixture	:	Substance
Chemical name	:	Silicon
Amount	:	99.99 % or more
Chemical Formula or Structural Formula	:	Si
Atomic weight	:	28.09
Reference Number in Gazetted List in Japan	:	Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. : - Industrial Safety and Health Act : -
CAS No.	:	7440-21-3 (Silicon)

4. First-aid Measures

If in Eyes	:	Rinse away thoroughly with clean water. Get medical advice/attention.
If on Skin	:	Remove contaminated clothes, shoes, and garment. Rinse away thoroughly with plenty of clean water. If developing some symptoms, seek medical advice as needed.
If Inhaled	:	Remove victim to fresh air and keep at rest. Get medical advice/attention.
If Ingested	:	Make victim drink plenty of water to induce vomiting. Get medical advice/attention if there is any problem.
Protecting Personnel in emergency measures	:	Use personal protective equipment. In the normal handling, risk is low.

5. Fire-fighting Measures

Extinguishing Media	:	This material is incombustible, use a fire extinguishing agent suitable for surrounding fire.
Specific Hazards	:	This CRM is nonflammable. But powdered material is flammable, there is a possibility of dust explosion. For powdered material may react with water liberating flammable or explosive gases.
Specific extinguishing measure	:	Remove any combustible sources from the seat of fire and extinguish using appropriate extinguishing agent. Transfer the movable container to a safe place promptly. If impossible to transfer, use water spray to cool the periphery.
Protection of Fire-Fighters	:	Carry out fire-fighting from the windward in order to avoid breathing hazardous gas. 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 : Remove ignition source in the vicinity immediately. Prepare fire-fighting equipment for the possibility of fires.
- Protective equipment and emergency procedure : Ventilate the affected areas thoroughly, if it is in an indoor environment, until the clean-up operation is completed. Use appropriate personal protective equipment during the operation to avoid skin contact of splash etc. and 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.
- Recovery and Neutralization : Collect scattered powder in empty containers and close the containers tightly. For recovery of scattered powder, do not use electric vacuum cleaner etc. which may be fire sources. Collect powders Use waste clothes or wiping clothes, and collect in empty containers.
- Prevention of Secondary Disaster : Mark the restricted area with rope etc. to keep out unauthorized people. Carry out the clean-up operation from the windward and make people on the leeward side evacuate.

7. Handling and Storage Precautions

Handling

- Engineering Precautions : Strict ban on fire.
Keep away from hot surfaces/sparks. Avoid contact with strong oxidizers.
- Local and General Ventilation : Use local ventilation system in indoor handling area.
- Precautions for Safe Handling : Since powder of this reference material is flammable, chips generated in cutting need to be handled appropriately.
Since powder of this reference material, when reacting with water, may release flammable or explosive gases, it needs to be handled appropriately.
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.
Wash hands, face etc. thoroughly and gargle after handling this reference material.
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.

Restrict drinking, eating and smoking to a designated area.
Do not bring gloves and other contaminated personal protective equipment into staff room.
Avoid sudden temperature changes (heat shock) which may cause cracks in the sample.
During processing, thermal and mechanical stresses to specimen of this reference material need to be reduced as much as possible to avoid cracks, fractures and strains on the specimen.

Storage

- Appropriate Storage Conditions : Keep out of sunlight and heat sources. Seal the case and stored in a clean and cool place at room temperature.
This CRM is recommended to be stored at 23 °C ±5 °C, at relative humidity less than 50 %, and under a nitrogen gas atmosphere.
- Safe Container : Plastic case
- Packaging Material

8. Exposure Control/Personal Protection

Threshold Limit Value

- Not specified

Permissible Concentration

- ACGIH TLV-TWA (2000) : 10 mg/m³
- Values recommended by Japan Society for Occupational Health(1998) : 2 mg/m³; respirable fraction
8 mg/m³; total dust
- OSHA PEL TWA : 8H TWA , 15 mg/m³; total dust
8H TWA , 5 mg/m³; respirable fraction

Engineering Controls

- Ventilation/Exhaust : Local ventilation system or General ventilation system
- Safety Control/ Gas Detection : Measuring equipment, Detecting tube
- Storage Precaution : Keep container tightly closed.
Keep away from moisture

This reference material reacts with water to release combustible or explosive gases at high temperature.

Personal Protective Equipment (PPE)

- Respiratory System : Gas mask for organic gases, Compressed air open-circuit self-contained breathing apparatus, if necessary.
- Hands : Protective gloves
- Eyes : Safety goggle
- Skin and Body : Protective clothing, Face protection

Hygiene Controls

Handle this reference material in accordance with industrial health and safety standards.

9. Physical and Chemical Properties

- Appearance, etc. : Single crystal. Rectangular block of 10 mm square and

	30 mm long
Color	: Metallic dark gray
Odor	: Odorless
pH	: No data
Melting point	: 1410 °C
Boiling point	: 2355 °C
Flashing point	: No data
Explosive range	: No-data.
	In case of fine powder, it may be dust explosive.
Vapor pressure	: 4.77 Pa (1414 °C)
Relative vapor density (Air=1)	: No data
Specific gravity or bulk specific gravity	: 2.33 g/cm ³ (25 °C)
Solubility	: No data
<i>n</i> -Octanol/water partition coefficient (Log Po/w)	: No data
Auto-ignition temperature	: No data

10. Stability and Reactivity

◇Stability

- Stable in normal conditions

◇Reactivity

- Reacts with oxygen at 400 °C or more and with nitrogen at 1000 °C or more to produce silicon (di)oxide and silicon nitride, respectively.
- Reacts with water at high temperature to release explosive hydrogen gas.
- Flaming ignition if in contact with oxidizers.
- Soluble in aqua regia, nitric acid containing hydrogen fluoride and sodium hydroxide.

◇Conditions to Avoid

- Violently reacts with oxidizer, Alkali carbonate, Calcium, Cesium carbide, Chlorine, Fluorine, Metal fluorides, etc. Sensitive to moisture.

◇Hazardous Decomposition Products

- Hydrogen

11. Toxicological Information

Acute Toxicity	Oral (Rat) LD50: 3,160 mg/kg (IUCLID:2000)
Serious Eye Damage/ Eye Irritation	Eye irritation (Rabbit): 3 mg Mild (RTECS)

12. Ecological Information

Ecotoxicity	: No data
Persistence and Degradability	: No data
Bioaccumulative Potential	: No data
Mobility in soil	: No data

Influence to the ozone layer : No data

13. Disposal Considerations

- Residual Waste : 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.
- Contaminated Container and Package : Dispose of containers after thoroughly removing their contents.
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14. Transport Information

- UN Number : 1346(Powder, amorphous, not applicable if the CRM is unopened)
UN Classification : Class 4.1
Material name : Silicon
Container grade : PG III
ICAO/IATA : -
Marine pollutant : N/A
- Precautions : Transport this reference material carefully while keeping it away from direct sunlight and fire and preventing accidental release due to falling, overturning, etc.
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15. Regulatory Information

- ◇ Fire Service Act
 - Article 2, category 2 metal powders (except powders whose content of powders with powder size less than 150 μm(screen size) is less than 50 %)
 - ◇ Civil Aeronautics Act
 - Ordinance for Enforcement of the Civil Aeronautics Act, Article 194 , Dangerous Goods, Flammable Solid (Class H-3)
 - ◇ Ship Safety Law
 - Dangerous Material Rule article 3, Hazardous class 4.1 Flammable substances (container grade 3)
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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.
