

# Safety Data Sheet



## 1. Identification of the Substance/Mixture and the Supplier

Supplier : National Institute of Advanced Industrial Science and Technology (AIST)  
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 Office in Charge : Reference Material Office, Center for Quality Management of Metrology, The National Metrology Institute of Japan  
 Person in Charge : Certified Reference Material Staff  
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 Emergency Contact : Same as above

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Identity of Substance/Mixture : Certified reference material: NMIJ CRM 5206-a  
 Recommended Use of the Chemical and Restriction on Use : Multiple BN Delta-layer Film on Arsenic-doped Si Substrate  
 : This CRM is intended for use in controlling the precision of analysis or adjusting the measurement conditions during depth-profile analysis by Secondary Ion Mass Spectrometry (SIMS).  
 Do not use this reference material for other purposes than testing/research.  
 This CRM is a reference material (specified in the Japanese Industrial Standard (JIS) Q 0030).

## 2. Hazards Identification

GHS Classification : Not classified  
 GHS Label Element : -  
 Signal Word : -  
 Hazards Statement : -  
 Other Hazards Statement : May cause incised wound at the edge of this reference material.  
 If broken, its scattered fractions or dust may get into eyes. As this reference material contains arsenic, though rather in trace amount, care should be exercised against scatter of its dust, etc.  
 Precautionary Statement : [Precaution]  
 Use appropriate personal protective equipment.  
 Get the instruction manual before use. Do not handle until all safety precautions have been read and understood.  
 Refer to the section "7. Handling and Storage".  
 [Action]  
 If swallowed: Rinse mouth. Do not induce vomiting. Immediately get medical advice/attention. [Storage]  
 Refer to the section "7. Handling and Storage".  
 [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.

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### 3. Composition/Information on Ingredients

Substance/Mixture	: Mixture
Compound 1	: Silicon
Amount	: 99.8 % or above
Chemical or structural formula	: Si
Molecular 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
Compound 2	: Arsenic
Amount	: 0.08 g/kg
Chemical or structural formula	: As
Molecular weight	: 74.92
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.	: 7440-38-2
Hazardous substance	:

※Structure of this CRM is as follows. BN layer and the Si thin film as a delta layer (8nm) are alternately laminated on the As-doped Si substrate, the thickness of the BN layer (chemical formula: BN, molecular weight: 24.82, CAS number: 10043-11-5) is 0.05 nm substantial amount, are formed four layers.

Structure of membrane: SiO<sub>2</sub>/Si/ BN/ Si/ BN/ Si/ BN/ Si/ BN/SiO<sub>2</sub>/ Si substrate (As-doped)

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### 4. First-aid Measures

If in Eyes	: Rinse with clean water thoroughly. Get medical advice/attention if there is any problem.
If on Skin	: Get medical advice/attention if there is any problem.
If Inhaled	: Dust or mist: Remove victim to fresh air and to rest in a position comfortable for breathing. Get medical advice/attention if there is any problem.

- If Ingested : Rinse mouth thoroughly with water. Do not induce vomiting, if it is not the instructions from a doctor. Get medical advice/attention when feeling unwell.
- Predicted immediate and delayed symptoms : Dust or mist: If in eyes or on mucous membranes, it causes a stimulatory effect.
- Most important symptom/effect : -
- Protecting Personnel in emergency measures : Use personal protective equipment.

## 5. Fire-fighting Measures

- Extinguishing Media : Use powder or sand. Do not use water and water-based fire-extinguishing agent.
- Fire-Specific Hazards : Powder is flammable, there is a possibility of dust explosion. For powdered CRM, it may react with water and liberate flammable or explosive gases. In the case of bulk this CRM is 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. 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 : Powder of this CRM is flammable Prepare fire-fighting equipment for the possibility of fires. 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 : Collect spillage in empty containers by getting it adsorbed to

Neutralization : wiping cloth, rag or earth and sand, etc.  
 Prevention of : 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 : Use appropriate personal protective equipment to avoid inhalation  
 Precautions and contact with eyes and skin. Avoid direct contact with human  
 body. Do not handle with bare hands.

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

Precautions for Safe : Avoid rough handling such as turning over, dropping, giving a  
 Handling 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.

### Storage

Appropriate : Avoid direct sun light and store in a clean place at room  
 Storage Conditions temperature from 5 °C to 35°C.

Substance which : • React with oxygen at 400 °C or above, to produce a silicon oxide.  
 should avoid React with nitrogen at 1000 °C or above, resulting in a silicon  
 contact oxide and silicon nitride.  
 • Reacts with water at high temperatures to release the explosion  
 of the original gas.  
 • Soluble in Aqua regia, nitric acid containing the hydrogen  
 fluoride, sodium hydroxide solution.

Safe Container : Fluorine resin container

### Packaging

### Material

## 8. Exposure Controls/Personal Protection

### Threshold Limit Value

- Not specified

### Permissible Concentration (Si)

• ACGIH TLV-TWA	:	TWA 10 mg/m <sup>3</sup>
• Values recommended by Japan Society for Occupational Health	:	2 mg/m <sup>3</sup> (respirable fraction) 8 mg/m <sup>3</sup> (total dust)
• OSHA PEL TWA	:	8H TWA 15 mg/m <sup>3</sup> (total dust) 8H TWA 5 mg/m <sup>3</sup> (respirable fraction)
Permissible Concentration (BN)	:	
• ACGIH TLV(s)	:	Not specified
• Values recommended by Japan Society for Occupational Health	:	Not specified
• OSHA PEL	:	Ventilate along floor surface. Seal. Keep away from flammable substances, reducing agents and strong oxidizers.
Facility engineering		
• Ventilation, exhaust	:	Local exhaust ventilation system or general ventilation system
• Storing precaution	:	Avoid direct sun light and store at normal room temperature in a dry place.
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.	:	Solid
• Color	:	Dark gray
• Odor	:	Odorless
• pH	:	No data
• Melting point	:	1410 °C (Si), 3000 °C (BN)
• Boiling point	:	2355 °C (Si)
• 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	:	2.33 g/cm <sup>3</sup> (Si)
• Solubility	:	Soluble in Aqua regia, nitric acid containing the hydrogen fluoride, sodium hydroxide solution.
• <i>n</i> -Octanol/water partition coefficient (Log Po/w)	:	No data

- Auto-ignition temperature : No data

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## 10. Stability and Reactivity

### ◇Stability

- Stable in normal conditions

### ◇Reactivity

- React with oxygen at 400 °C or above, to produce a silicon oxide. React with nitrogen at 1000 °C or above, resulting in a silicon oxide and silicon nitride.
- Reacts with water at high temperatures to release the explosion of the original gas.
- Soluble in Aqua regia, nitric acid containing the hydrogen fluoride, sodium hydroxide solution.

### ◇Conditions to Avoid

- Sunlight, Heat, High humidity

### ◇Hazardous Decomposition Products

- No data

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## 11. Toxicological Information

Acute Toxicity	Oral	Rat LD50	3160 mg/kg (RTECS)
	Abdominal cavity	Rat LDLo	500 mg/kg (RTECS)
Serious Eye Damage/ Eye Irritation	Eye Irritation	Rabbit	3 mg (mild) (RTECS)

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## 12. Ecological Information

Degradability, concentration

- No-data

Bioaccumulative Potential

- No-data

Ecotoxicity

- No-data

Mobility in soil

- No-data

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## 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.

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## 14. Transport Information

UN Number : 1346  
UN : Class 4.1  
Classification

Material name : Silicon  
Container grade : PG III  
Marine pollutant : N/A  
Precautions : Avoid direct sunlight and transfer with care not to spill/leak by dropping or falling, etc.

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### 15. Regulatory Information

◇Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof (PRTR system Pollutant Release and Transfer Register)

- Class 1 Designated Chemical Substance No.405 (BN)

◇Water Pollution Control Act

- Hazardous substance (Article 2, Enforcement Order: Article 2) (BN)

◇Soil Contamination Countermeasures Act

- Specified Hazardous Substances (BN)
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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.

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