

SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

Product Identifier

SRM Number: 640d
SRM Name: Silicon Powder Line Position and Line Shape Standard for Powder Diffraction
Other Means of Identification: Not applicable.

Recommended Use of This Material and Restrictions of Use

This Standard Reference Material (SRM) is intended for use as a standard for calibration of diffraction line positions and line shapes, determined through powder diffractometry. A unit of SRM 640d consists of approximately 7.5 g of silicon powder bottled under argon.

Company Information

National Institute of Standards and Technology
 Standard Reference Materials Program
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2. HAZARDS IDENTIFICATION

Classification

Physical Hazard: Flammable Solids Category 2
Health Hazard: Acute Toxicity Category 5 (Oral)
Label Elements
Symbol



Signal Word
 WARNING

Hazard Statement(s)

H228 Flammable solid.
 H303 May be harmful if swallowed.

Precautionary Statement(s)

P210 Keep away from heat/sparks/open flames/hot surfaces – No smoking.
 P280 Wear protective gloves/protective clothing/eye protection/face protection.
 P312 Call a POISON CENTER or doctor/physician if you feel unwell.
 P370 + P378 In case of fire: Use dry powder for metal fires or other appropriate media for extinction.

Hazards Not Otherwise Classified: Not applicable.

Ingredients(s) with Unknown Acute Toxicity: Not applicable.

3. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Substance: Silicon powder, amorphous

Other Designations:

Elemental silicon; polyeristalline silicon powder.

Components are listed in compliance with OSHA's 29 CFR 1910.1200; for the actual values see the Certificate of Analysis.

Hazardous Component(s)	CAS Number	EC Number (EINECS)	Nominal Mass Concentration (%)
Silicon powder	7440-21-3	231-130-8	100

4. FIRST AID MEASURES

Description of First Aid Measures:

Inhalation: If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration or oxygen by qualified personnel. Seek immediate medical attention.

Skin Contact: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention if needed. Thoroughly clean and dry contaminated clothing before reuse.

Eye Contact: Immediately flush eyes, including under the eyelids with copious amounts of water for at least 15 minutes. Seek immediate medical attention.

Ingestion: If a large amount is swallowed, seek medical attention.

Most Important Symptoms/Effects, Acute and Delayed: Mechanical irritation.

Indication of any immediate medical attention and special treatment needed, if necessary: If any of the above symptoms are present, seek immediate medical attention.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Dust/air mixtures may ignite or explode. Silicon powder, amorphous is a flammable solid.

Extinguishing Media:

Suitable: Dolomite, dry powder for metal fires, dry sand, graphite, soda ash, sodium chloride.

Unsuitable: Water.

Specific Hazards Arising from the Chemical: None listed.

Special Protective Equipment and Precautions for Fire-Fighters: Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH approved self-contained breathing apparatus (SCBA).

NFPA Ratings (0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe)

Health = 1

Fire = 3

Reactivity = 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures: Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment; see Section 8, "Exposure Controls and Personal Protection".

Methods and Materials for Containment and Clean up: Do not touch spilled material. Notify safety personnel of spills. Collect spilled material in appropriate container for disposal. Isolate hazard area and deny entry. Clean up residue with a high-efficiency particulate filter vacuum.

7. HANDLING AND STORAGE

Safe Handling Precautions: See Section 8, “Exposure Controls and Personal Protection”. Use methods to minimize dust.

Storage: Store and handling in accordance with all current regulations and standards. Keep separated from incompatible substances; see Section 10 “Stability and Reactivity” for incompatible substances.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits:

Component: Silicon metal powder

NIOSH (REL): 10 mg/m³ TWA (total dust); 5 mg/m³ TWA (respirable dust).

ACGIH (TLV): No exposure limits established.

OSHA (PEL): 15 mg/m³ TWA (total dust); 5 mg/m³ TWA (respirable fraction).

Engineering Controls: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

Personal Protection: In accordance with OSHA 29 CFR 1910.132, subpart I, wear appropriate Personal Protective Equipment (PPE) to minimize exposure to this material.

Respiratory Protection: If workplace conditions warrant a respirator, a respiratory protection program that meets OSHA 29CFR 1910.134 must be followed. Refer to NIOSH 42 CFR 84 for applicable certified respirators.

Eye/Face Protection: Wear splash resistant safety goggles with a face shield. An eye wash station should be readily available near areas of use.

Skin and Body Protection: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Chemical-resistant gloves should be worn at all times when handling chemicals.

9. PHYSICAL AND CHEMICAL PROPERTIES

Descriptive Properties:

Appearance
(physical state, color, etc.):

Silicon metal powder

Lustrous gray to black powder, color is moisture sensitive

Molecular Formula:

Si

Molar Mass (g/mol):

28.09

Odor:

Odorless

Odor threshold:

Not applicable

pH:

Not applicable

Evaporation rate (ether = 1):

Not available

Melting point/freezing point (°C):

1410 (2570 °F)

Relative Density (g/L):

2.33 g/cc (25 °C)

Vapor Pressure (mmHg):

1 mmHg (1724 °C)

Vapor Density (air = 1):

Not applicable

Viscosity (cP):

Not applicable

Solubility(ies):

Nitric acid/hydrofluoric acid mixtures, molten alkali oxides, molten metals, germanium

Insoluble

organic solvents; insoluble in water, HCl, HNO₃ and HF

Partition coefficient
(n-octanol/water):

Not available

Particle Size (if relevant)

4.1 µm

Thermal Stability Properties:

Autoignition Temperature (°C):	780 (1436 °F)
Thermal Decomposition (°C):	Not applicable
Initial boiling point and boiling range (°C):	2355 (4271 °F)
Explosive Limits, LEL (Volume %):	160 g/m ³
Explosive Limits, UEL (Volume %):	Not available
Flash Point (°C)	Not applicable
Flammability (solid, gas):	Flammable solid

10. STABILITY AND REACTIVITY

Reactivity: Stable at normal temperatures and pressure.

Stability: Stable Unstable

Possible Hazardous Reactions: Dust/air mixtures may ignite or explode.

Conditions to Avoid: Avoid generating dust. Avoid heat, flames, sparks or other sources of ignition.

Incompatible Materials: Acids, halogens, metal carbide, metal salts, metals, oxidizing materials.

Fire/Explosion Information: See Section 5, "Fire Fighting Measures".

Hazardous Decomposition: Thermal decomposition will produce oxides of silicon.

Hazardous Polymerization: Will Occur Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Exposure: Inhalation Skin Ingestion

Symptoms Related to the Physical, Chemical and Toxicological Characteristics: Eye, skin and respiratory irritation.

Potential Health Effects (Acute, Chronic and Delayed):

Inhalation: Acute exposure to inert dust may result in mucous membrane irritation and cough. Chronic exposure to inert dust may result in chronic bronchitis.

Skin Contact: Contact may cause mechanical irritation. No data listed for chronic exposure.

Eye Contact: Dust may cause irritation through mechanical abrasion. No data listed for chronic exposure.

Ingestion: Ingestion may cause digestive tract irritation. No data listed for chronic exposure.

Numerical Measures of Toxicity:

Acute Toxicity: Category 5.

Silicon, Rat, Oral LD50: 3160 mg/kg

Skin Corrosion/Irritation: No data available.

Serious Eye damage/ Eye irritation: Not Classified.

Rabbit, eye: 3 mg, mild.

Respiratory Sensitization: No data available.

Skin Sensitization: No data available.

Germ Cell Mutagenicity: No data available.

Carcinogenicity: Not classified.

Listed as a Carcinogen/Potential Carcinogen Yes No

Silicon metal is not listed by NTP, IARC, or OSHA as a carcinogen.

Reproductive Toxicity: Not classified.

Specific Target Organ Toxicity, Single Exposure: Not classified.

Specific Target Organ Toxicity, Repeated Exposure: Not classified.

Aspiration Hazard: Not applicable.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data:

Component: Silicon: No data available.

Persistence and Degradability: No data available.

Bioaccumulative Potential: No data available.

Mobility in Soil: No data available.

Other Adverse effects: No data available.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose of waste in accordance with all applicable federal, state, and local regulations. Silicon subject to disposal regulations: U.S. EPA 40 CFR 262, Hazardous Waste Number: D001

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: UN1346, Silicon powder, amorphous, Hazard Class 4.1, Packing Group III.

15. REGULATORY INFORMATION

U.S. Regulations:

CERCLA Sections 102a/103 (40 CFR 302.4): Not regulated.

SARA Title III Section 302 (40 CFR 355.30): Not regulated.

SARA Title III Section 304 (40 CFR 355.40): Not regulated.

SARA Title III Section 313 (40 CFR 372.65): Not regulated.

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE HEALTH:	No.
CHRONIC HEALTH:	No.
FIRE:	Yes.
REACTIVE:	No.
PRESSURE:	No.

State Regulations:

California Proposition 65: Not listed.

U.S. TSCA Inventory: Listed.

TSCA 12(b), Export Notification: Not listed.

Canadian Regulations:

WHMIS Information: Not provided for this material.

16. OTHER INFORMATION

Issue Date: 13 November 2013

Sources: ChemAdvisor, Inc., MSDS *Silicon*, 11 September 2013.

Hazardous Substances Data Bank, National Library of Medicine, *Silicon, Elemental* CAS 7440-21-3, available at <http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?./temp/~IORHxi:1> (accessed Nov 2013).

International Labor Organization International, International Chemical Safety Card (ICSC) database, *Silicon*, available at: http://www.ilo.org/dyn/icsc/showcard.display?p_lang=en&p_card_id=1508 (accessed Nov 2013).

Key of Acronyms:

ACGIH	American Conference of Governmental Industrial Hygienists	NIOSH	National Institute for Occupational Safety and Health
ALI	Annual Limit on Intake	NIST	National Institute of Standards and Technology
CAS	Chemical Abstracts Service	NRC	Nuclear Regulatory Commission
CEN	European Committee for Standardization	NTP	National Toxicology Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	OSHA	Occupational Safety and Health Administration
CFR	Code of Federal Regulations	PEL	Permissible Exposure Limit
CPSU	Coal Mine Dust Personal Sample Unit	RCRA	Resource Conservation and Recovery Act
DOT	Department of Transportation	REL	Recommended Exposure Limit
EC50	Effective Concentration, 50 %	RM	Reference Material
EINECS	European Inventory of Existing Commercial Chemical Substances	RQ	Reportable Quantity
EPCRA	Emergency Planning and Community Right-to-Know Act	RTECS	Registry of Toxic Effects of Chemical Substances
IARC	International Agency for Research on Cancer	SARA	Superfund Amendments and Reauthorization Act
IATA	International Air Transportation Agency	SCBA	Self-Contained Breathing Apparatus
IDLH	Immediately Dangerous to Life and Health	SRM	Standard Reference Material
ISO	International Organization for Standardization	STEL	Short Term Exposure Limit
LC50	Lethal Concentration, 50 %	TDL _o	Toxic Dose Low
LD50	Lethal Dose, 50 %	TLV	Threshold Limit Value
LEL	Lower Explosive Limit	TPQ	Threshold Planning Quantity
MSDS	Material Safety Data Sheet	TSCA	Toxic Substances Control Act
NFPA	National Fire Protection Association	TWA	Time Weighted Average
MSHA	Mine Safety and Health Administration	UEL	Upper Explosive Limit
		WHMIS	Workplace Hazardous Materials Information System

Disclaimer: Physical and chemical data contained in this SDS are provided only for use in assessing the hazardous nature of the material. The SDS was prepared carefully, using current references; however, NIST does not certify the data in the SDS. The certified values for this material are given in the NIST Certificate.

Users of this SRM should ensure that the SDS in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <http://www.nist.gov/srm>.