

SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

Product Identifier

SRM Number: 1979

SRM Name: Powder Diffraction Line Profile Standard for Crystallite Size Analysis
(Nano-Crystalline Zinc Oxide Powder)

SRM Part: Zinc Oxide Powder 15 nm Crystallites
Zinc Oxide Powder 60 nm Crystallites

Other Means of Identification: Not applicable.

Recommended Use of This Material and Restrictions of Use

This Standard Reference Material (SRM) is intended for use in the analysis of crystallite size through the degree of profile broadening in a powder diffraction experiment. A unit of SRM 1979 consists of two samples of zinc oxide powder, the first with a median crystallite size of approximately 15 nm and a second with a median of approximately 60 nm. Each sample contains approximately 3 g of powder bottled in an argon atmosphere.

Company Information

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2. HAZARDS IDENTIFICATION

Classification

Physical Hazard: Not classified.

Health Hazard: Not classified.

Label Elements

Symbol: No symbol/No pictogram.

Signal Word: No signal word.

Hazard Statement(s): Not applicable.

Precautionary Statement(s): Not applicable.

Hazards Not Otherwise Classified: Not applicable.

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

3. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Substance: Zinc oxide

Other Designations: Zinc white; Chinese white; flowers of zinc; zinc monoxide; zinc gelatin; white zinc; permanent white; philosopher's wool; zincoide; snow white; ZnO

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

Hazardous Component(s)	CAS Number	EC Number (EINECS)	Nominal Mass Concentration (%)
Zinc oxide	1314-13-2	215-222-5	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. Thoroughly clean and dry contaminated clothing and shoes before reuse.

Eye Contact: Flush eyes with water for at least 15 minutes. If necessary, seek medical attention.

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

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

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

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Negligible fire hazard. See Section 9, "Physical and Chemical Properties" for flammability properties.

Extinguishing Media:

Suitable: Regular dry chemical, carbon dioxide, water, regular foam.

Unsuitable: None listed.

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).

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures: Use suitable protective equipment; see Section 8, "Exposure Controls and Personal Protection".

Methods and Materials for Containment and Clean up: Collect spilled material in appropriate container for disposal. Avoid generating dust. Clean up residue with a high-efficiency particulate filter vacuum.

7. HANDLING AND STORAGE

Safe Handling Precautions: Minimize dust generation. See Section 8, "Exposure Controls and Personal Protection".

Storage: It is recommended that the unused portion of the powder be stored in its original bottle, tightly capped and in a dry environment. Store and handling in accordance with all current regulations and standards. Keep separated from incompatible substances (See Section 10, "Stability and Reactivity").

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits:

ACGIH (TLV): 2 mg/m³ (TWA, respirable particulates)
10 mg/m³ (STEL, respirable particulates)

NIOSH (REL): 5 mg/m³ (TWA, dust and fume)
10 mg/m³ (STEL, fume)
15 mg/m³ (Ceiling, dust)
500 mg/m³ (IDLH)

OSHA (PEL): 5 mg/m³ (TWA, fume)
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.):	white or gray, powder
Molecular Formula:	ZnO
Molar Mass (g/mol):	81.37
Odor:	odorless
Odor threshold:	not available
pH (solution):	6.95 to 7.37
Evaporation rate:	not applicable
Melting point/freezing point (°C):	1975 (3587 °F)
Relative Density (g/mL):	5.6
Vapor Pressure (mmHg):	0.0 at 21 °C
Vapor Density (air = 1):	>1
Viscosity (cP):	not applicable
Solubility(ies):	water soluble (1.6 ppm at 29 °C); soluble in dilute acetic acid, mineral acids, ammonia, ammonium chloride solutions, ammonium salt solutions, fixed alkali hydroxide solutions, strong alkali
Partition coefficient (n-octanol/water):	not available
Particle Size:	1-20 µm

Thermal Stability Properties:

Autoignition Temperature (°C):	not applicable
Thermal Decomposition (°C):	not available
Initial boiling point and boiling range (°C):	not applicable
Explosive Limits, LEL (Volume %):	not applicable
Explosive Limits, UEL (Volume %):	not applicable
Flash Point (°C):	not applicable
Flammability (solid, gas):	not available

10. STABILITY AND REACTIVITY

Reactivity: Stable at normal temperatures and pressure.

Stability: X Stable Unstable

Possible Hazardous Reactions: None listed.

Conditions to Avoid: Avoid generating dust.

Incompatible Materials: Halo carbons, combustible materials, metals, acids, oxidizing materials.

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

Hazardous Decomposition: Thermal decomposition will produce zinc, oxides of zinc.

Hazardous Polymerization: Will Occur X Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Exposure: X Inhalation Skin X Ingestion

Symptoms Related to the Physical, Chemical and Toxicological Characteristics: Exposure may cause irritation.

Potential Health Effects (Acute, Chronic and Delayed):

Inhalation: Acute: irritation; inhaled fumes may cause metal fume fever, difficulty breathing; chronic: nausea and liver damage.

Skin Contact: Acute: low potential for skin irritation, although it can alter skin pigmentation; chronic: skin disorders.

Eye Contact: Acute: mechanical irritation, redness, and pain; chronic: no information available.

Ingestion: Acute: nausea, diarrhea, constipation; chronic: no information available.

Numerical Measures of Toxicity:

Acute Toxicity: Not classified.

Rat, Oral LD50: >5000 mg/kg

Mouse, Inhalation LC50: 2500 mg/m³

Skin Corrosion/Irritation: Not classified.

Rabbit, Skin (mild): 500 mg (24 h)

Serious Eye Damage/Irritation: Not classified.

Rabbit, Eyes (mild): 500 mg (24 h)

Respiratory Sensitization: Not classified; no data available.

Skin Sensitization: Not classified; no data available.

Germ Cell Mutagenicity: Not classified; no data available.

Carcinogenicity: Not classified.

Listed as a Carcinogen/Potential Carcinogen _____ Yes _____ X No

Zinc oxide is not listed by IARC, NTP or OSHA as a carcinogen.

Reproductive Toxicity: Not classified.

Rat, Oral TDLo: 6846 mg/kg (pregnant 1 d to 22 d)

Specific Target Organ Toxicity, Single Exposure: Not classified; no data available.

Specific Target Organ Toxicity, Repeated Exposure: Not classified; no data available.

Aspiration Hazard: Not classified; no data available.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data: 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.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: Not regulated by DOT or IATA.

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): 1.0 % de minimis concentration (related to Zinc compounds).

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: No.
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: 07 October 2024

Sources: ChemADVISOR, Inc., SDS *Zinc Oxide*, 09 December 2015.

CDC_NIOSH_Pocket_Guide_to_Chemical_Hazards Zinc oxide; available at
<https://www.cdc.gov/niosh/npg/npgd0675.html> (accessed Oct 2024).

Key of Acronyms:

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

Disclaimer: The NIST SDS information is specific to the NIST product and is believed to be correct, based upon our current knowledge. The SDS may not necessarily be all inclusive and should be used only as a guide. NIST does not guarantee the accuracy or completeness of this information. The only official source for specific values and uncertainties is the certificate or report.

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; e-mail srmmsds@nist.gov; or via the Internet at <https://www.nist.gov/srm>.