

## 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 mean crystallite size of approximately 15 nm and a second with a mean 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; zincoid; snow white; ZnO

Components are listed in compliance with OSHA's 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

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## 4. FIRST AID MEASURES

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### 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 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.

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## 5. FIRE FIGHTING MEASURES

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**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).

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

Health = 0

Fire = 0

Reactivity = 0

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## 6. ACCIDENTAL RELEASE MEASURES

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**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.

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## 7. HANDLING AND STORAGE

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**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").

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## 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

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### Exposure Limits:

ACGIH (TLV): 2 mg/m<sup>3</sup> (TWA, respirable particulates)  
10 mg/m<sup>3</sup> (STEL, respirable particulates)

NIOSH (REL): 5 mg/m<sup>3</sup> (TWA, dust and fume)  
10 mg/m<sup>3</sup> (STEL, fume)  
15 mg/m<sup>3</sup> (Ceiling, dust)  
500 mg/m<sup>3</sup> (IDLH)

OSHA (PEL): 5 mg/m<sup>3</sup> (TWA, fume)  
15 mg/m<sup>3</sup> (TWA, total dust)  
5 mg/m<sup>3</sup> (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.

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## 9. PHYSICAL AND CHEMICAL PROPERTIES

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### Descriptive Properties:

<b>Appearance</b> (physical state, color, etc.):	white or gray, powder
<b>Molecular Formula:</b>	ZnO
<b>Molar Mass (g/mol):</b>	81.37
<b>Odor:</b>	odorless
<b>Odor threshold:</b>	not available
<b>pH (solution):</b>	6.95 to 7.37
<b>Evaporation rate:</b>	not applicable
<b>Melting point/freezing point (°C):</b>	1975 (3587 °F)
<b>Relative Density (g/mL):</b>	5.6
<b>Vapor Pressure (mmHg):</b>	0.0 at 21 °C
<b>Vapor Density (air = 1):</b>	>1
<b>Viscosity (cP):</b>	not applicable
<b>Solubility(ies):</b>	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
<b>Partition coefficient (n-octanol/water):</b>	not available
<b>Particle Size:</b>	15 nm or 60 nm (as indicated)

### Thermal Stability Properties:

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

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## 10. STABILITY AND REACTIVITY

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**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

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## 11. TOXICOLOGICAL INFORMATION

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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/m<sup>3</sup>

**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.

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## 12. ECOLOGICAL INFORMATION

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**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.

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## 13. DISPOSAL CONSIDERATIONS

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**Waste Disposal:** Dispose of waste in accordance with all applicable federal, state, and local regulations.

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## 14. TRANSPORTATION INFORMATION

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

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## 15. REGULATORY INFORMATION

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### 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.

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## 16. OTHER INFORMATION

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Issue Date: 04 August 2016

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

### 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 Transport Association	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 %	TDLo	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 of Analysis.

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](mailto:srmmsds@nist.gov); or via the Internet at <http://www.nist.gov/srm>.