

## SAFETY DATA SHEET

### 1. SUBSTANCE AND SOURCE IDENTIFICATION

**Product Identifier**

**SRM Number:** 1898  
**SRM Name:** Titanium Dioxide Nanomaterial  
**Other Means of Identification:** Not applicable.

**Recommended Use of This Material and Restrictions of Use**

This Standard Reference Material (SRM) is intended primarily for use as a benchmark and investigative tool for evaluation of the potential environmental, health, and safety risks that may be associated with manufactured nanomaterials during their product life-cycle. This SRM is also intended for use in the calibration and performance testing of gas sorption instruments used for determining the specific surface area of powders and porous solids. A unit of SRM 1898 consists of an amber glass bottle containing nominally 15 g of mixed-phase (anatase and rutile) nanocrystalline titanium dioxide (TiO<sub>2</sub>) in the form of a dry agglomerated powder.

**Company Information**

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### 2. HAZARDS IDENTIFICATION

**Classification**

**Physical Hazard:** Not Classified.  
**Health Hazard:** Carcinogenicity, Category 2.

**Label Elements**

**Symbol**



**Signal Word**

WARNING

**Hazard Statement(s)**

H351 Suspected of causing cancer (inhalation).

**Precautionary Statement(s)**

P201 Obtain special instructions before use.  
 P202 Do not handle until all safety precautions have been read and understood.  
 P280 Wear protective gloves, protective clothing, eye protection, and face protection.  
 P308+P313 If exposed or concerned: get medical attention.  
 P405 Store locked up.  
 P501 Dispose of contents and container in accordance with local regulations.

**Hazards Not Otherwise Classified:** None.

**Ingredients(s) with Unknown Acute Toxicity:** None.

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### 3. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

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**Substance:** Titanium dioxide.

**Other Designations:** Titanium oxide; TiO<sub>2</sub>; Titanium peroxide; anatase; rutile.

Components are listed in compliance with OSHA's 29 CFR 1910.1200.

Hazardous Component(s)	CAS Number	EC Number (EINECS)	Nominal Mass Concentration (%)
Titanium dioxide, nanoparticles	13463-67-7	236-675-5	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 well-ventilated (uncontaminated) area. If breathing is difficult, qualified personnel may administer oxygen. If not breathing, qualified personnel should give artificial respiration. Seek immediate medical attention.

**Skin Contact:** Rinse affected skin with water for at least 15 minutes, then wash thoroughly with soap or mild detergent and water. If skin irritation persists, seek medical aid and bring the container or label.

**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

**Inhalation:** Irritation, cough, difficulty breathing, cancer (suspect).

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

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### 5. FIRE FIGHTING MEASURES

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**Fire and Explosion Hazards:** Negligible fire hazard.

#### Extinguishing Media

Suitable: Use extinguishing agents appropriate for surrounding fire.

Unsuitable: Not applicable.

**Specific Hazards Arising from the Chemical:** Not applicable.

**Special Protective Equipment and Precautions for Fire-Fighters:** Move container from fire area if it can be done without personal risk. Avoid inhalation of material or combustion by-products. 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 = 0                  Reactivity = 0

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### 6. ACCIDENTAL RELEASE MEASURES

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**Personal Precautions, Protective Equipment and Emergency Procedures:** Collect spilled material in appropriate container for disposal. Refer to Section 8, "Exposure Controls and Personal Protection".

**Methods and Materials for Containment and Clean up:** Stop spill if possible without personal risk. Clean up dust with a damp cloth or a high efficiency HEPA-filtered vacuum.

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## 7. HANDLING AND STORAGE

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**Safe Handling Precautions:** See Section 8, “Exposure Controls and Personal Protection”.

**Storage and Incompatible Materials:** Store in a well-ventilated area. Keep separated from incompatible substances (metals). Avoid generating dust.

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## 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

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**Exposure Limits:** No occupational exposure limits have been established. The exposure limits for Particulates Not Otherwise Regulated are applicable.

OSHA (PEL): 15 mg/m<sup>3</sup> (TWA, total particulates)  
5 mg/m<sup>3</sup> (TWA, respirable particulates)

NIOSH (REL): 0.3 mg/m<sup>3</sup> (10 h) TWA (ultrafine titanium dioxide, including engineered nanoscale)

NIOSH (IDLH): 5000 mg/ m<sup>3</sup>

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

**Personal Protection Measures:** 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 Protection:** Eye protection is not required but recommended.

**Skin and Body Protection:** Protective clothing and gloves are not required but recommended.

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## 9. PHYSICAL AND CHEMICAL PROPERTIES

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### Descriptive Properties:

<b>Appearance (physical state, color, etc.):</b>	white or black powder
<b>Molecular Formula:</b>	TiO <sub>2</sub>
<b>Molar Mass (g/mol):</b>	79.88
<b>Odor:</b>	odorless
<b>Odor threshold:</b>	not available
<b>pH (solution):</b>	neutral
<b>Evaporation rate:</b>	not applicable
<b>Melting point/freezing point (°C):</b>	1850 (3362 °F)
<b>Specific Gravity (water = 1):</b>	3.8
<b>Vapor Pressure (mmHg):</b>	not applicable
<b>Vapor Density (air = 1):</b>	not applicable
<b>Viscosity (cP):</b>	not applicable
<b>Solubility(ies):</b>	insoluble in water; soluble in hot concentrated sulfuric acid, hydrofluoric acid, alkali; insoluble in hydrochloric acid, nitric acid, dilute sulfuric acid.
<b>Partition coefficient (n-octanol/water):</b>	not available
<b>Particle Size (if relevant):</b>	19 to 37 nm

### Thermal Stability Properties

<b>Autoignition Temperature:</b>	not applicable
<b>Thermal Decomposition</b>	not applicable
<b>Initial boiling point and boiling range:</b>	2500 °C to 3000 °C (4532 °F to 5432 °F)
<b>Explosive Limits, LEL:</b>	not applicable
<b>Explosive Limits, UEL:</b>	not applicable
<b>Flash Point</b>	not applicable
<b>Flammability (solid, gas):</b>	not applicable

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## 10. STABILITY AND REACTIVITY

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**Reactivity:** This material is not reactive at normal temperatures and pressure.

**Stability:**  X  Stable   Unstable

**Possible Hazardous Reactions:** Not applicable.

**Conditions to Avoid:** Generating dust.

**Incompatible Materials:** Metals.

**Hazardous Decomposition:** Oxides of titanium, miscellaneous decomposition products.

**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:** Irritation with coughing and sneezing.

### Potential Health Effects (Acute, Chronic, and Delayed)

**Inhalation:** Irritation with coughing and sneezing as a nuisance dust. Long term exposure may cause pulmonary irritation with cough, difficulty breathing, a decline in pulmonary function, and x-ray evidence of mild fibrosis. Rats showed small focal areas of emphysema attributed to large amounts of dust. Bronchial adenomas and non-neoplastic pulmonary keratinizing cysts occurred at the 250 mg/m<sup>3</sup> level.

**Skin Contact:** Topically, titanium dioxide is nontoxic, and nonirritating, however, in some cases it may cause miliaria due to occlusion.

**Eye Contact:** Mechanical irritation with redness and pain.

**Ingestion:** Large quantities may cause intestinal obstruction; no other adverse effects identified.

### Numerical Measures of Toxicity

**Acute toxicity:** Not classified.

Titanium dioxide: Rat, Oral, LD50: >10 000 mg/kg

**Skin corrosion/irritation:** Not classified.

Titanium dioxide: Human, skin 300 µg, (3 day) intermittent, mild effects reported.

**Serious eye damage/eye irritation:** Not classified.

**Respiratory sensitization:** No data available.

**Skin sensitization:** No data available.

**Germ Cell Mutagenicity:** No data available.

**Carcinogenicity:** Category 2.

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

IARC lists titanium dioxide as Group 2B, *possibly carcinogenic to humans*.

OSHA and NTP do not list titanium dioxide as a carcinogen.

Mutagenic data:

Titanium dioxide: Human, lung, 100 µg/ plate (DNA damage).

Titanium dioxide: Hamster, lung, 500 mg/L (DNA inhibition).

Tumorigenic data:

Titanium dioxide: Rat, inhalation, TCLo: 250 mg/m<sup>3</sup> (6 h over 2 years, intermittent).

**Reproductive Toxicity:** Not classified.

**Specific target organ toxicity, single exposure:** No data available.

**Specific target organ toxicity, repeated exposure:** No data available.

**Aspiration hazard:** Not applicable.

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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 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): 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:	Yes
FIRE:	No
REACTIVE:	No
PRESSURE:	No

### State Regulations

California Proposition 65: Warning! This product contains a chemical (titanium dioxide) known to the state of California to cause cancer.

**U.S. TSCA Inventory:** Titanium dioxide is 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:** 23 September 2020

**Sources:** ChemADVISOR, Inc., MSDS *Titanium Dioxide*, 09 December 2015.

National Library of Medicine, PubChem Database, *Titanium Dioxide*, CAS No. 13463-67-7, available at <https://pubchem.ncbi.nlm.nih.gov/> (accessed Sep 2020).

NIOSH Publications, *Approaches to Safe Nanotechnology: Managing the Health and Safety Concerns Associated with Engineered Nanomaterials*; available at <https://www.cdc.gov/niosh/docs/2009-125/> (accessed Sep 2020).

NIOSH Publications, *General Safe Practices for Working with Engineered Nanomaterials in Research Laboratories*; available at <https://www.cdc.gov/niosh/docs/2012-147/> (accessed Sep 2020).

### Key of Acronyms:

ACGIH	American Conference of Governmental Industrial Hygienists	NTP	National Toxicology Program
CAS	Chemical Abstracts Service	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
DOT	Department of Transportation	REL	Recommended Exposure Limit
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
LC50	Lethal Concentration	STEL	Short Term Exposure Limit
LD50	Median Lethal Dose or 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
NIOSH	National Institute for Occupational Safety and Health	UEL	Upper Explosive Limit
NIST	National Institute of Standards and Technology	WHMIS	Workplace Hazardous Materials Information System

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