1. PRODUCT AND MANUFACTURER IDENTIFICATION

Product names:

NanoActive® Titanium (IV) Oxide – NanoActive® TiO_2

Manufacturer:
NanoScale Corporation
1310 Research Park Drive
Manhattan, KS 66502
(785) 537-0179

Product Information
785-537-0179
24-Hour Chemtrec Emergency Number:
U.S. (800) 424-9300
International (703) 527-3887

2. CHEMICAL COMPOSITION AND EXPOSURE LIMITS

Component	CAS Number:	OSHA PEL:	ACGIH TLV:
Titanium dioxide	13463-67-7	15 mg/m^3 dust	10 mg/m^3 dust

3. HAZARD IDENTIFICATION AND EMERGENCY OVERVIEW

Appearance and Odor: Fine white odorless powder

Routes of Exposure: Eye and skin contact, inhalation.

Eye Contact: May cause physical eye irritation.
Skin Contact: May cause irritation.
Inhalation: May be irritating to mucous membranes and upper respiratory tract.
Ingestion: May cause irritation of the digestive tract.

Acute Health Effects: May cause physical irritation of the skin and eyes, with redness and swelling, cough, and sneezing.

Signs and symptoms of overexposure: Acute effects include irritation of mucous membranes and upper respiratory tract. Exposure may cause diarrhea.

4. FIRST AID MEASURES

Skin: In case of skin contact, flush with copious amounts of water for at least 15 minutes.

Inhalation: If inhaled, remove to fresh air.

Eyes: In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating eyelids with fingers. Seek medical attention.

Ingestion: If swallowed, wash out mouth with water provided that person is conscious. Seek medical attention.

For internal contact via wounds, flush wound with water.

5. FIRE-FIGHTING MEASURES

Titanium dioxide is neither flammable nor explosive. Titanium dioxide may be exposed to water, carbon dioxide, dry chemical, and foam extinguishing agents as necessary during firefighting operations.

6. ACCIDENTAL RELEASE MEASURES

A spill of titanium dioxide poses hazards similar to other nuisance dusts.

Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, using the appropriate protective equipment. Avoid generating dusty conditions, provide adequate ventilation

7. HANDLING AND STORAGE

Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Respiratory Protection: Use NIOSH approved respirator when use is necessary. As with any nuisance dust, the use of NIOSH approved respirators is recommended in cases where prolonged exposure is expected.
Skin Protection: Wear appropriate protective gloves and clothing to prevent skin exposure.
Eye Protection: Wear appropriate protective glasses or chemical safety goggles.
Other Protective Equipment: Wear appropriate protective clothing to minimize contact with skin.

Titanium dioxide can adsorb moisture and natural oils from the surface of the skin during prolonged exposure. Prolonged exposure should be avoided by wearing suitable protective gloves and clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Color/Appearance: White powder
Odor: None
Molecular Weight: 79.9
Boiling Point: 2500-3000^{o} C
Melting Point: 1830-1850^{o} C
Specific Gravity: 3.9 @ 20^{o} C
Vapor Pressure: No data

10. STABILITY AND REACTIVITY

Stability: Stable under normal temperatures and pressures.
Hazardous Polymerization: None reported.
Incompatibility: Lithium at 200^{o} C.
Decomposition Products: None reported.

11. TOXICOLOGICAL INFORMATION

Acute Oral Toxicity: LD_{50} > 2 g/kg
Acute Dermal Toxicity: LD_{50} > 5 g/kg
Acute Dermal Irritation: PII = 0, non-irritating
Skin Sensitization: Non-sensitizer
Acute Eye Irritation: Practically non-irritating
Acute Inhalation: EPA Toxicity Category IV, non-toxic.

Chronic *dust* inhalation exposure (250 mg/m^3 for 6hrs/day, 5day/week for 2 years) can be a potential carcinogen to rats. The authors of this study concluded that based on the excessive dust loading and overwhelmed clearance mechanism in the lungs of rats exposed chronically at 250 mg/m^3, the biological relevance of lung tumors to man appears to be negligible.

A number of epidemiology studies evaluating > 20,000 TiO_2 industry workers in Europe and the United States have been reported. Workers employed for at least six months in TiO_2 production were assessed using company records and quality controls, taking into account the different manufacturing procedures used a the sites as well as the actual relative levels of exposure to respirable TiO_2. Exposure categories such as job site, title, and calendar years on the job were examined. Findings from each of the studies were similar, in that the authors concluded that the results did not suggest a carcinogenic effect of TiO_2 dust on the human lung, and mortality from other chronic diseases, including other respiratory diseases, was not associated with exposure to TiO_2 dust. Based upon the results of these studies, NanoScale Corporation concludes that titanium dioxide will not cause lung cancer or chronic respiratory disease in humans at concentrations experienced in the workplace.

Carcinogen status: OSHA – No, NTP – No, ACGIH (TiO_2) – Group 3; Not classifiable as a human carcinogen. IARC – 2B; possibly carcinogenic to humans

Although the three animal studies reviewed by IARC showed evidence of tumors it is important to note that these studies tested pigmentary and ultrafine titanium dioxide. As stated in the IARC *draft* monograph, volume 93, primary particle sizes for pigmentary titanium dioxide are typically between 0.2 and 0.3 µm. Ultrafine grades range from 10-50 nm. NanoScale's NanoActive® Titanium Dioxide particles are larger and do not fall into the pigmentary or ultrafine classifications. Also, as realized in studies reviewed by NIOSH, the toxicity seems to be more related to the particle size rather than the chemical itself.

12. ECOLOGICAL INFORMATION

None available.

13. DISPOSAL CONSIDERATIONS

Disposal of titanium dioxide should be in accordance with applicable local, state, and federal regulations. Titanium dioxide is a non-hazardous waste under the TCLP rule of RCRA.

14. TRANSPORT INFORMATION

(49 CFR 172.101-2): not listed

15. REGULATORY INFORMATION

TSCA: TiO2 is listed in the TSCA inventory.
SARA (Title 313): Not subject to reporting requirements.
CERCLA RQ: None

This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

16. OTHER INFORMATION

The above information is believed to be correct but does not purport to be all-inclusive and shall be used only as a guide. NanoScale Corporation makes no warranty with respect hereto and disclaims all liability from reliance thereon. The information is intended for use by persons with professional knowledge of the subject matter or with access to such persons. Persons receiving this information are urged to conduct their own assessment of the suitability and completeness of the information for their particular application.