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MATERIAL SAFETY DATA SHEET

Titanium Dioxide

Date prepared: November 21, 2015

Product Information

Product Identifier: TITANIUM DIOXIDE

Formula: TiO_2

Chemical Type: Pigment

WHMIS Class: Not regulated

Intended Use: Raw Material for manufacturing industry.

Composition/Information on Ingredients

Material	CAS Number	%
Titanium Dioxide	13463-67-7	80-99
Aluminum Hydroxide	21645-51-2	0-9
Amorphous Silica	7631-86-9	0-10

Physical and Chemical Properties

Physical Data (dry product)

Boiling Point: Not applicable Vapour Pressure: Not volatile

Vapour Density: Not volatile Melting Point: Not applicable

Evaporation Rate: Not volatile Solubility in Water: Insoluble

pH: 4-10 Odour: None

Form: Powder, solid Colour: White

Specific Gravity: 3.8-4.3

Stability and Reactivity

Chemical Stability: Stable

Incompatibility with Other Materials: None reasonably foreseeable

Decomposition: Decomposition with not occur

Polymerization: Polymerization with not occur

Toxicological Information

Animal Data: Some but not all grades of. Titanium Dioxide contain Amorphous Silica.

Titanium Dioxide: Oral ALD : >24,000 mg/kg in rats

Dermal ALD : >10,000 mg/m³ in rabbits

Inhalation 9-hour ALC: >6.82 mg/L in rats

Amorphous Silica Oral LD50: >10,000 mg/kg in rats

The product contains Titanium Dioxide which is a slight (HMIS scale) or moderate eye irritant and a slight skin irritant, but is not a skin sensitizer in animals. This product may contain Amorphous Silica which is a mild eye irritant and is a negligible to slight skin irritant when tested as a 50% aqueous paste in animals.

Amorphous Silica dust is not expected to be a skin irritant. Animal testing indicates Amorphous Silica is not a skin sensitizer. In short term inhalation studies of Titanium Dioxide mixtures containing 6% Aluminum Hydroxide and 8% Silicon Dioxide, a slight fibrogenic response occurred in animals exposed to 1,300 mg/m³ for 4 weeks respirable dust. A typical dust cell reaction but no fibrogenic response was noted in animals similarly exposed to Titanium Dioxide, or Titanium Dioxide mixtures containing from 1% to 3% Aluminum Hydroxide, and 2.7 to 6% Silicon Dioxide.

Repeated inhalation exposure to Amorphous Silica caused pulmonary changes including reversible inflammation. Long-term exposure caused pulmonary changes including reversible inflammation, vascular obstruction and emphysema. Guinea pigs exposed to Aluminum Hydroxide by inhalation exhibited no evidence of injurious effects but did show progressive accumulation of aluminum in the lungs.

Repeated and long term ingestion of Titanium Dioxide caused no significant toxicological effects. Single, repeated and long-term exposure by ingestion to Amorphous Silica caused no significant toxicological effects. Ingestion of Aluminum Hydroxide caused growth impairment, and bone changes due to phosphate depletion in animals but ingestion of phosphate eliminates these changes; no evidence of other toxicity was noted.

In lifetime inhalation studies of respirable Titanium Dioxide at levels up to 250 mg/m³, no compound-related clinical signs of toxicity were seen in the exposed animals. Slight pulmonary fibrosis was seen at 50 and 250 mg/m³ respirable dust levels but not at 10 mg/m³. There was no evidence of cancer in animals exposed to 10 or 50 mg/m³ respirable Titanium Dioxide. Microscopic lung tumors were seen in 17 percent of the rats exposed to 250 mg/m³ respirable Titanium Dioxide. The lung tumors seen in the rat were different from common human lung cancers, relative to anatomic type and location, occurred only at dust level which overwhelmed the animal's lung clearance mechanism and, therefore, are of questionable biological relevance for man.

In lifetime animal feeding tests at levels up to 50,000 ppm, Titanium Dioxide showed no evidence of veneer or other significant adverse effects in either rats or mice. No animal data are available to define the developmental or reproductive toxicity of Titanium Dioxide. Tests have shown that Titanium Dioxide does not cause genetic damage in bacterial or mammalian cell cultures, or in animals. Animal testing indicates Amorphous Silica does not have carcinogenic or reproductive effects. Amorphous Silica has not produced genetic damage in bacterial cultures.

Hazards Identification

Potential Health Effects: Eye contact may cause eye irritation with tearing, pain or blurred vision. Repeated skin contact with Titanium Dioxide may cause drying or cracking of the skin in sensitive individuals.

Short-term overexposure by inhalation to Titanium Dioxide may cause irritation of nose, throat, and lungs with cough, difficulty breathing or shortness of breath. Results of an epidemiology study showed that employees who had been exposed to Titanium Dioxide were at no greater risk of developing lung cancer than were employees who had not been exposed to Titanium Dioxide. No pulmonary fibrosis was found in any of the employees and no association was observed between Titanium Dioxide exposure and chronic respiratory disease or x-ray abnormalities. Based on the results, this study concludes that Titanium Dioxide will not cause lung cancer or chronic respiratory disease in humans at concentrations experienced in the workplace. Inhalation of Amorphous Silica may cause drying of mucous membranes and irritation of nose, throat, and lungs with nosebleeds, cough, difficulty breathing or shortness of breath. Based on animal experiments, long term exposures to high doses could lead to pulmonary inflammation and subsequent development of chronic lung disease. Amorphous Silica does not induce the lung effects associated with crystalline silica. Epidemiology studies have not shown any evidence of fibrosis in workers exposed to Amorphous Silica dust levels ranging from 2 to 7 mg/m³. Increased susceptibility to the effects of Amorphous silica may be observed in persons with pre-existing disease of the lungs.

Carcinogenicity Information

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NPT, OSHA or ACGIH as a carcinogen.

First Aid Measures

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Skin Contact: The compound is not likely to be hazardous by skin contact but cleansing the skin after use is advisable.

Eye Contact: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

Ingestion: No specific intervention is indicated as compound is not likely to be hazardous by ingestion. However, if symptoms occur, consult a physician.

Fire Fighting Measures

Flammable Properties: Will not burn.

Extinguishing Media: Any media as appropriate for combustibles in area.

Fire Fighting Instructions: None.

Accidental Release Measures

Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Accidental Release Measures: For dry product, shovel into covered container for disposal. Flush residue to wastewater treatment system. For slurry product, flush to wastewater treatment plant or settling basin, or soak up with sand or other absorbent and shovel into covered metal container for disposal. Do not use water in the clean-up of spills; do not flush residue to the wastewater treatment system.

Handling and Storage

Handling (Personnel)

In the manufacture of titanium dioxide, product is packaged at temperatures of approximately 100° to 120° Centigrade (212° to 248° Fahrenheit). When pigment is shipped shortly after manufacture, it may stay hot for a very long time depending on ambient temperatures and inventory storage practices. Due to the potential of elevated pigment temperature, caution should be used while handling pigment and in solvent applications. Each work environment must be assessed to determine hazards.

The following caution is provided for grades packaged in plastic bags:

Caution: Plastic bag material may cause static ignition hazard in the presence of flammable or explosive vapor/air mixtures. Do not handle or use bags in the presence of flammable or explosive vapor/air mixtures. For dry product avoid breathing dust. If slurry product is allowed to dry, avoid breathing dust. Use dust filter respirator if exposure limits are exceeded (see Personal Protective Equipment).

Storage: We recommend the following guidelines for safely stacking pallets of Titanium Dioxide:

- Mid-size containers (1102 lb./500 kg.) and semi-bulk containers (2209 lb./1000 kg.) for all grades should not be stacked more than two pallets high.
- All other Titanium Dioxide grades packaged in paper or plastic bags should not be stacked more than three pallets high. Protect containers of dry product from damage.

Exposure Controls/Personal Protection

Engineering Controls: Good general ventilation should be provided to keep dust concentrations below the exposure limits.

Personal Protective Equipment: If exposure limits are exceeded for dust or dried-down product, NIOSH approved air purifying respirators equipped with particulate filters (properly

fitted dust masks) should be used. Protective gloves should be worn to prevent prolonged skin contact with alkaline slurries. For dry product or dried-down product, use a protective barrier cream and/or protective gloves to prevent skin contamination.

Eye Protection (minimum: safety glasses with side shields) is also required when handling Titanium Dioxide.

Exposure Guidelines and Applicable Exposure Limits

Titanium Dioxide: PEL (OSHA): 15 mg/m³, total dust, 8 Hr. TWA

TLV (ACGIH): 10 mg/m³, total dust. 8 Hr. TWA, A4

Amorphous Silica: PEL (OSHA): 80 mg/m³ / % SiO₂ - 8 Hr TWA

TLV (ACGIH): 10 mg/m³ total dust, 8 Hr. TWA

Ecological Information

Aquatic Toxicity: 96 hour LC50, fathead minnows: >1,000 mg/L

Disposal Considerations

Waste Disposal: Comply with Federal, State, and local regulations. If approved, remove to land disposal area.

Transportation Information

Shipping: Not Regulated as a hazardous material by DOT, IMO, or IATA.

Regulatory Information

U.S. Federal Regulations TSCA Inventory Status: Reported/Included.

Title III Hazard Classifications Sections 311, 312

Acute: Yes Chronic: No Fire: No

Reactivity: No Pressure: No

Lists

Extremely Hazardous Substance: No CERCLA Hazardous Substance: No

Toxic Chemical: No

Canadian WHMIS Classification: Not Regulated

Other Information

NFPA, NPCA-HMIS, NPCA-HMIS Rating

Health: 1 Flammability: 0 Reactivity: 0

Personal Protection rating to be supplied by user depending on use conditions.

The information contained herein is based on data from sources considered to be reliable and accurate. This information is provided as a service to our customers and is valid only when the product is used for the purpose and in the manner described above. If in doubt, further tests should be conducted by the user. Before using any product, always read the

label.