MATERIAL SAFETY DATA SHEET

The MSDS format adheres to the standards and regulatory requirements of the United States and Canada and may not meet regulatory requirements in other countries.

1. PRODUCT INFORMATION

Product Name: **KRONOS® TITANIUM DIOXIDE PIGMENT**	**NORTH AMERICA CONTACT INFORMATION**	
	UNITED STATES	**CANADA**
This MSDS covers the following Product Codes: 1000, 1001, 1002, 1014, 1020, 1025, 1050, 1071, 1074, 1075, 2020, 2044, 2047, 2063, 2064, 2071-U, 2073, 2075, 2078, 2081, 2084, 2090, 2101, 2160, 2190, 2211, 2220, 2230, 2233, 2300, 2310, 2360, 2450, 2500, 2800, 2900, 2980, 3025, 3333 and 4311. **Prepared by:** KRONOS NORTH AMERICA 5 Cedar Brook Drive Cranbury, NJ 08512 **Revision date:** August 13, 2012 **Supersedes date:** February 1, 2012	**MANUFACTURER** **KRONOS, Inc.** **P.O. Box 4272** **Houston, TX 77210-4272** **Gen. Info.: (800) 866-5600** **EMERGENCY TELEPHONE:** **CHEMTREC: (800) 424-9300** **KRONOS: (800) 866-5600**	**SUPPLIER** **KRONOS Canada, Inc.** **3390 Marie-Victorin** **Varennes QC** **J3X 1T4** **Gen. Info.: 450-929-5113** **EMERGENCY TELEPHONE:** **514-397-1550 (24 hrs/day)** **MANUFACTURER** **KRONOS, Inc. and affiliates** **P.O. Box 4272** **Houston, TX 77210-4272** **Gen. Info.: (800) 866-5600** **EMERGENCY TELEPHONE:** **KRONOS: (800) 866-5600**

2. PRODUCT COMPOSITION

Product Component(s)	**C.A.S. No.**	**Percent***
Titanium Dioxide -- primary particle diameter is greater than 100 nm.	13463-67-7	80 - 100
Aluminum Oxide KRONOS Product Code(s): 2020, 2073, 2075, 2081, 2084, 2160, 2211, 2220, 2230, 2233, 2300, 2310, 2360, 2450, 2500, 2800 and 4311	1344-28-1	1
Aluminum Hydroxide KRONOS Product Code(s): 1071, 1074, 1075, 2020, 2044, 2047, 2063, 2064, 2081, 2084, 2090, 2101, 2160, 2190, 2211, 2220, 2300, 2310, 2360, 2800 and 4311.	21645-51-2	1 - 5
Amorphous Silica KRONOS Product Code(s): 1075, 2047, 2081, 2101, 2160, 2220 and 2360 KRONOS Product Code(s): 2044.	112926-00-8	1 – 5 5 – 10
*Component percentages are stated on a dry basis.		

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW:

Dry product: White odorless powder. Chemically stable. Product is non-combustible. Does not present a fire hazard or other immediate concerns for emergency responders, except may create a slippery condition if gets wet.

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Slurry product: Alkaline (pH = 8 - 10.5) white water slurry. Chemically stable. Does not pose a fire hazard. May create a slippery condition.

WARNING – POTENTIAL HEALTH EFFECTS:

- **EYE CONTACT**: Powder may cause mechanical eye irritation. Alkaline slurry can irritate eyes.
- **SKIN CONTACT**: Powder and alkaline slurry may irritate skin, especially if not promptly washed off skin.
- **SKIN ABSORPTION**: This product is not expected to be absorbed through intact skin.
- **INGESTION**: No adverse health effects anticipated by this route.
- **INHALATION**:
  - **ACUTE EFFECTS**: Exposure to dust may cause temporary drying effect and/or mild irritation of the nose, throat, and lungs, and may aggravate pre-existing respiratory conditions.
  - **CHRONIC EFFECTS/CARCINOGENICITY**: Titanium dioxide has been characterized by IARC as possibly carcinogenic to humans (Group 2B) through inhalation (not ingestion). This classification is based upon animal inhalation studies. Epidemiology studies do not suggest an increased risk of cancer in humans from occupational exposure to titanium dioxide. See Section 11 for further detail.

4. FIRST AID MEASURES

Inhalation:	Remove person to fresh air. If person appears to have difficulty breathing or respiratory irritation, seek medical attention.
Eye Contact:	Rinse eyes immediately with water for at least 15 minutes. See a physician.
Skin Contact:	Wash skin thoroughly with soap and water. See a physician if irritation persists.
Ingestion:	Provide symptomatic treatment and seek medical attention.

5. FIRE FIGHTING MEASURES

Flash Point: N.A.	**Method:** N.A.	**LEL:** N.A.	**UEL:** N.A.

EXTINGUISHING MEDIA/FIRE FIGHTING PROCEDURES:

The pigment is noncombustible; its packaging is combustible. Subject to what would be an appropriate extinguishing medium for, or in light of, the surrounding materials, use the following extinguishing media when fighting fires involving this product: water fog, foam, dry chemical, or carbon dioxide.

UNUSUAL FIRE HAZARDS: None.

6. ACCIDENTAL RELEASE MEASURES

RELEASE RESPONSE

Minimize dusting. CAUTION: may cause a slippery condition when wet. Sweep/shovel up and transfer dry product into a suitable container for re-use or disposal. Flush slurry product to internal wastewater facility or soak up with absorbent and shovel into suitable container for disposal. Do not flush into surface water or sanitary sewer system.

PERSONAL PROTECTIVE EQUIPMENT: Please refer to Section 8 for personal protective equipment information.

7. HANDLING AND STORAGE

HANDLING

- ❍ Avoid contact with the eyes.
- ❍ Do not breathe dust or mist.
- ❍ Avoid high concentrations of dust or mist in air through the use of ventilation or other suitable controls.

Please refer to Section 8 for engineering control and personal protection equipment information.

Warning: Titanium dioxide product may be packaged at temperatures of approximately 100 to 120° C (212 to 248° F) and stay hot for a 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.

STORAGE

Avoid freezing.

8. EXPOSURE CONTROL INFORMATION

OCCUPATIONAL EXPOSURE LIMITS (see Section 15 for other applicable OELs)

COMPONENT	**ACGIH – TLV** (as 8 hr. TWA)	**U.S. OSHA – PEL** (as 8 hr. TWA)
Titanium Dioxide	10 mg/m^3, total.	15 mg/m^3, total.
Nuisance Dust/PNOC	3 mg/m^3, respirable 10 mg/m3, inhalable	5 mg/m^3, respirable; 15 mg/m^3, total
Aluminum hydroxide	Not established.	Not established.
Aluminum oxide	10 mg/m3, total.	5 mg/m^3, respirable; 15 mg/m^3, total
Amorphous silica	Withdrawn.	80 mg/m^3 % SiO2

Particle size considerations

Fine particles are respirable particles with a primary particle diameter of at least 100 nm. Ultrafine particles are respirable particles with a primary particle diameter less than 100 nm. This product is not manufactured to contain ultrafine particles as defined above, and the level of any incidental ultrafine particles is not measurable at this time. If, however, the user reduces the particle size of this product (through milling or some other process) so that a significant portion is in the ultrafine range, the significance of the reduced particle size should be taken into consideration.

ENGINEERING CONTROL MEASURES:

Use local exhaust ventilation if airborne concentrations would otherwise exceed applicable exposure limits.

PERSONAL PROTECTION EQUIPMENT:

Respiratory:	Wear a NIOSH-approved air-purifying respirator equipped with an appropriate 100 series filter for protection against dusts and mists, as appropriate for the exposure levels and conditions of use. The respirator must be selected by a technically qualified individual.
Hand:	Dry product: Use gloves appropriate to protect against abrasion or irritation from poorly soluble dust. Slurry product: Use gloves appropriate to protect against skin contact with alkaline slurry.

Eye:	Wear eye protection that is compatible with any respiratory protection employed. If splashing may occur, wear safety glasses with side shields, face shield, and/or vented goggles.

OTHER CONTROL MEASURES: have emergency eye wash and shower available.

Use good industrial hygiene practices. Wash hands and face before eating or drinking. Wash work clothing after each shift.

9. PROPERTIES

DRY PRODUCT

Appearance: White powder	**Odor:** None	**pH:** N.A.
Boiling Range: N.A.	**Melting Range:** > 1000° C	**Specific Gravity:** 3.7 - 4.2
Solubility: Insoluble	**Vapor Density:** N.A.	**Vapor Pressure:** N.A.
% Volatile: 0	**Freezing Point:** N.A.	**Density at 20° C:** 30 - 35 lbs/U.S. gal.

SLURRY PRODUCT

Appearance: Milky white liquid	**Odor:** None	**pH:** 8.0 – 10.5
Boiling Range: approx. 100° C	**Melting Range:** N.A.	**Specific Gravity:** 2.1 – 2.4
Solubility: solids are insoluble	**Vapor Density:** N.A.	**Vapor Pressure:** same as water
% Volatile: <30	**Freezing Point:** approx. 0° C	**Density at 20° C:** 17 – 20 lbs/U.S. gal.

10. REACTIVITY INFORMATION

Conditions to Avoid:	Avoid contact with metals at high temperatures.
Hazardous Polymerization:	Hazardous polymerization will not occur.
Hazardous Decomposition:	Hazardous decomposition will not occur.
Stability:	This material is stable under normal operating conditions.

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11. HEALTH/TOXICITY INFORMATION

HEALTH HAZARDS

The following information regarding health hazards is based upon third-party research studies.

Effects of Acute Exposure

Inhalation: Inhalation of dust or mist can cause irritation of the eyes, nose, throat, and lungs.
Eye Contact: Like any foreign body, particles can cause mechanical irritation.
Skin Contact: This material can cause irritation if not promptly washed from the skin.
Skin Absorption: This product is not expected to be absorbed through intact skin.
Ingestion: This material is not expected to produce adverse effects.

Effects of Chronic Exposure

Titanium Dioxide: In lifetime inhalation studies of rats, airborne respirable-size titanium dioxide particles have been shown to cause an increase in lung tumors at concentrations associated with substantial particle lung burdens and consequential pulmonary overload and inflammation. The potential for these adverse health effects appears to be closely related to the particle size and the amount of the exposed surface area that comes into contact with the lung. However, tests with other laboratory animals, such as mice and hamsters, indicate that rats are significantly more susceptible to the pulmonary overload and inflammation that causes lung cancer. Epidemiology studies do not suggest an increased risk of cancer in humans from occupational exposure to titanium dioxide.

Titanium dioxide has been characterized by IARC as possibly carcinogenic to humans (Group 2B) through inhalation (not ingestion). It has not been characterized as a potential carcinogen by either NTP or OSHA.

Aluminum Oxide, Aluminum Hydroxide and Amorphous Silica: Inhalation of dust particles composed of these materials (or mist containing these materials) may cause drying of mucous membranes and irritation of nose, throat, and lungs with nosebleeds, cough, difficulty breathing or shortness of breath. Based solely on animal studies, long term inhalation exposure to high doses of ultrafine particles (or mist containing these particles) could lead to pulmonary inflammation and could be a factor in the subsequent development of chronic lung disease. Amorphous silica does not induce the lung effects associated with crystalline silica.

Medical Conditions Aggravated: Respiratory disorders.

Acute Toxicity: Titanium Dioxide		
Oral	LD50	> 10,000 mg/kg (rat)
Dermal	LD50	> 10,000 mg/kg (rabbit)
Inhalation	LC50 (4 hr)	> 6.8 mg/l (rat)

12. ECOLOGICAL INFORMATION

None of significance.

13. DISPOSAL CONSIDERATIONS

Dispose of in accordance with local, state, and federal regulations. Use a licensed waste handler.
Do not flush into surface water or sanitary sewer system.

14. TRANSPORTATION

Shipping Name: Titanium Dioxide Pigment		**Label:** N.A.
Hazard Class: Not regulated	**Packing Group:** N.A.	**UN#:** N.A.

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15. REGULATORY INFORMATION

CHEMICAL INVENTORIES In compliance denotes that all components are on the inventory or exempt.

U.S. TSCA Inventory:	Listed
Canadian Domestic Substances List:	Listed

SARA 313 Information: Not regulated.

Regulatory Status

California Prop 65 WARNING: This product contains a chemical known to the State of California to cause cancer. The listing is for titanium dioxide (airborne, unbound particles of respirable size) and does not cover titanium dioxide when it remains within a product matrix.

Canada: This product has been classified in accordance with hazard criteria of the Hazardous Products Act and Controlled Product Regulations (WHMIS). This material is a Class D, Division 2, Subdivision B controlled product under WHMIS, and this MSDS contains all information required by WHMIS.

U.S.: This product is a hazardous chemical under the OSHA Hazard Communication Standard.

OTHER OCCUPATIONAL EXPOSURE LIMITS (OELS).

****ALL OELS ARE EXPRESSED AS AN 8-HR TWA UNLESS NOTED OTHERWISE****

Country/Province/State	Titanium dioxide		Nuisance Dust (PNOC)	
	Total Dust	Respirable	Total Dust	Respirable
Canada - Alberta	10 mg/m3	N.E.	10 mg/m3	3 mg/m3
Canada – New Brunswick	1997 ACGIH TLV	1997 ACGIH TLV	1997 ACGIH TLV	1997 ACGIH TLV
Canada - Newfoundland and Labrador	10 mg/m3	N.E.	10 mg/m3	3 mg/m3
Canada - NW Territories	10 mg/m3	5 mg/m3	10 mg/m3	5 mg/m3
Canada - Nova Scotia	10 mg/m3	N.E.	10 mg/m3	3 mg/m3
Canada - Ontario	10 mg/m3	N.E.	10 mg/m3 (inhalable)	3 mg/m3
Canada - Quebec	10 mg/m3	N.E.	10 mg/m3	N.E.
Canada - Saskatchewan	10 mg/m3. 20 mg/m3, 15-min. avg.	N.E.	10 mg/m3. 20 mg/m3, 15-min. avg.	3 mg/m3. 6 mg/m3, 15-min. avg.
Canada- Yukon Territories	10 mg/m3. 20 mg/m3, 15-min. avg.	N.E.	N.E.	N.E.

Country/Province/State	Amorphous silica	
	Total Dust	Respirable
Canada - Alberta	10 mg/m3	N.E.
Canada – New Brunswick	1997 ACGIH TLV	N.E.
Canada - Newfoundland and Labrador	Withdrawn	Withdrawn
Canada-NW Territories	5 mg/m3	2 mg/m3
Canada - Nova Scotia	Withdrawn	Withdrawn
Canada - Ontario	10 mg/m3	N.E.
Canada- Quebec	N.E.	6 mg/m3
Canada- Saskatchewan	10 mg/m3. 20 mg/m3, 15-min. avg.	N.E.
Canada- Yukon Territories	20 mmppcf	2 mg/m3

16. OTHER INFORMATION

H.M.I.S. CODES	Health: 1 Flammability: 0 Reactivity: 0

Abbreviations

N.A. = Not applicable
N.E. = Not established