

ThyssenKrupp Materials NA, Inc.
MATERIAL SAFETY DATA SHEET
Titanium 6 - 4

SECTION I. MATERIAL IDENTIFICATION

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| COMPANY ThyssenKrupp Materials NA, Inc. 22355 West Eleven Mile Road Southfield, Michigan 48033 | RE-ISSUE DATE 5-Dec-08 | IDENTIFICATION NUMBER N/A |
| TRADE NAME 6-4 Titanium | EMERGENCY PHONE NUMBER (248) 233-5681 | PREPARED BY: J. VanValkenburg |
| CHEMICAL NAME Titanium | FORMULA DOT N/A | IDENTIFICATION NO. N/A |

SECTION II HAZARDOUS INGREDIENTS

| MATERIAL OR COMPONENT | % COMPOSITION | PHYSICAL | OSHA-mg/m3 | ACGIH mg/m3 | WISHA | |
|-----------------------|---------------|--------------|-----------------------|-------------|-------------|-----------|
| BASE METAL | CAS NUMBER | BY WEIGHT | Description | 8-HR. - TWA | 8-HR. - TWA | PEL mg/m3 |
| TITANIUM | 7440-32-6 | 88.75 - 91.0 | AS TITANIUM DUST/FUME | 15.0 | 10.0 | 10.0 |

NOT ALL OF THE ELEMENTS LISTED BELOW ARE PRESENT IN ALL ALLOYS OF ALUMINUM

| ALLOYING | % COMPOSITION | PHYSICAL | OSHA-mg/m3 | ACGIH mg/m3 | WISHA | |
|----------|---------------|---------------|------------------|-------------|-------------|-----------|
| ELEMENTS | CAS NUMBER | BY WEIGHT (1) | Description | 8-HR. - TWA | 8-HR. - TWA | PEL mg/m3 |
| VANADIUM | 7440-62-6 | 3.5 - 4.5 | AS VANADIUM DUST | 0.1 | 0.05 | 0.05 |
| ALUMINUM | 7429-90-5 | 5.5 - 6.75 | AS ALUMINUM DUST | 15.0 | 10.0 | 10.0 |

PEL=Permissible Exposure Limit (1) % of Alloying Material Vanes with Grade of Material. Other trace elements of <1% May be in Present.

SECTION III. PHYSICAL DATA

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| MATERIAL (At Normal Conditions) SOLID | APPEARANCE AND ODOR Silver-gray metallic appearance; No odor |
| MELTING POINT 2800-3040 Deg. F | SPECIFIC GRAVITY 4.5 |

SECTION IV. FIRE AND EXPLOSIVE

SPECIAL FIRE FIGHTING PROCEDURES: Damp titanium dust with hydrogen may form explosive air mixtures. Small chips, fine turnings and dust may ignite readily. Explosion potential may exist when dust and fines are dispensed in the air. Avoid contact with metal oxides, molten aluminum and moisture. Titanium Products in their solid state present no fire or explosive hazard.

SECTION V. REACTIVITY DATA

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| STABILITY Stable under normal handling conditions. | CONDITIONS TO AVOID Be aware of unsecure loads. |
| HAZARDOUS DECOMPOSITION PRODUCTS Metallic Dust Or Fumes May Be Produced During Welding, Burning, Grinding And Possibly Machining. Refer To ANSI Z49.1 | |

SECTION VI. Environmental

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| SPILL OR LEAK PROCEDURES | N/A |
| WASTE DISPOSAL METHODS | Disposal must comply with applicable Federal, State and Local disposal and discharge laws. |

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SECTION VII. HEALTH HAZARD DATA

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| NOTE: | TITANIUM PRODUCTS IN THEIR NATURAL STATE DO NOT PRESENT AN INHALATION OR CONTACT HAZARD, HOWEVER OPERATIONS SUCH AS BURNING, WELDING, SAWING, BRAZING AND GRINDING MAY RELEASE FUMES AND/OR DUST WHICH MAY PRESENT HEALTH HAZARDS. |
| EFFECTS OF OVEREXPOSURE: | |
| Acute - | Dust or fume may cause irritation to the eyes, nose, or throat and may leave a metallic taste in the mouth. Inhalation of oxides of Manganese, Magnesium, and Zinc may be manifested as flu-like symptoms commonly known as "metal fume fever". |
| Titanium: | Inhalation may cause Fibrosis of the lungs. Has caused lung cancer in animals. |
| Aluminum: | Inhalation of Aluminum Oxide fume or an accumulation of Silicon in the lungs may result in benign pneumoconiosis. |
| Vanadium: | Inhalation of Vanadium oxides may result in metallic taste, throat irritation, cough and/or bronchitis. Contact may cause local irritation. |
| Welding Fume: | Is listed as a possible carcinogen to humans. |
| Coatings: | If coated with oil, contact may cause skin irritation/dermatitis |

SECTION VIII. EMERGENCY AND FIRST AID PROCEDURES

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| Inhalation | In the event of excessive exposure to dust or fume, remove the employee to fresh air. If breathing is difficult administer artificial respiration or oxygen. Obtain immediate medical assistance. |
| Skin: | Abrasions and cuts should be washed and closed by a clean compress and be immediately medically treated. Should skin irritation occur, wash affected area with mild soap and rinse with clean warm water. Obtain medical assistance. |
| Eyes: | Depending on the type and nature of exposure, relief may be obtained by fresh air or rinsing the eyes with clean water. Obtain medical assistance. |
| Medical Conditions Aggravated by Exposure: | Persons with a predisposition to respiratory disorders may be adversely affected by particulates or respiratory irritants generated during the mfg. process. |

SECTION IX. SPECIAL PROTECTION INFORMATION & CONTROL MEASURES

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| Note: | Consult your regional codes or Code of Federal Regulations, Title 29, Part 1910. Subpart G-Occupational Health and Environmental Control, Subpart I Personal Protective Equipment. Subpart P-Welding, Cutting, and Brazing, and Subpart Z-Toxic and Hazardous Substances. Certain welding type activities may produce hazardous substances such as carbon monoxide, ozone, phosgene in the presence of certain chemicals, or produce inert suffocating atmospheres in addition to the production of ultraviolet radiation and/or noise. |
| Ventilation: | Additional air make up systems may be required if, local exhaust or ventilation systems are not sufficient to maintain exposure levels to contaminants below prescribed limits. When inhalation controls are not sufficient to reduce the exposure below the applicable exposure limit then use OSHA/NIOSH approved respiratory protection within the use limitations of the respirator. |
| Personal | To avoid contact use appropriate protective gloves or clothing to protect against cutting edges Appropriate heat shielding garments should be |
| Protection: | used for activities using or generating heat. Eyes should be protected by using safety glasses, goggles, helmet, face shield as appropriate to the operation |
| Precautions to be taken in handling and storage: | Be alert to sharp edges and unsecured Lifts. |

SECTION X. OTHER INFORMATION

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| SARA Section 313 Toxic Chemical List, de minimis Concentrations | > 1.0%: Aluminum, Zinc, and Manganese |
| Additional Information: | Prevent dust clouds, use NFPA guidelines for the collection, storage, and disposal of chips, powder, dust or turnings from machining. Store titanium in a dry location, wet, moist or high humidity storage may lead to corrosion of titanium. See the National Fire Protection Association Bulletin NFPA 480, "Storage, Handling, and Processing of Magnesium". |
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