ATI Allegheny Ludlum
Allegheny Technologies

MATERIAL SAFETY DATA SHEET

1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT(S): TITANIUM - GRADE 1, 2, 3, 4, 7, 12
MSDS CATEGORY: VII-A
MANUFACTURER:
ALLEGHENY LUDLUM CORPORATION
100 RIVER ROAD
BRACKENRIDGE, PA 15014

DESCRIPTION: Solid metallic product, various forms and uses
EMERGENCY PHONE: 724-226-5555
INFO. PHONE: 724-226-5980 (M-F, 9 a.m.-4:30 p.m. EST)
CHEMTREC: 800-424-9300
DATE OF APPROVAL: 9-15-04

2 - COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT	CAS NUMBER	PERCENTAGE BY WEIGHT	OSHA PEL	ACGIH TLV
Titanium	7440-32-6	95 - 99	15 mg/m^3, Titanium Dioxide form, total dust	10 mg/m^3, Titanium Dioxide form, total dust

NOTE: 1) All exposure limits are 8-hour TWAs unless otherwise specified. 2) All commercial metals may contain small amounts of various elements in addition to those specified. These small quantities (less than 0.1%), frequently referred to as "trace" or "residual" elements, generally originate in the raw material used. These elements may include, but are not limited to the following: Sulfur, Phosphorous, Nitrogen, Arsenic, Boron, Cadmium, Calcium, Lead, Tin, Vanadium, Zirconium and Palladium. Abbreviations and acronyms are defined in Section 16.

3 - HAZARDS IDENTIFICATION

GENERAL HAZARD STATEMENT: Solid metallic products distributed by Allegheny Ludlum are generally classified as "articles" and do not constitute a hazardous material in solid form under the terms of the OSHA Hazard Communication Standard. Any articles manufactured from these solid products would be generally classified as non-hazardous. However, some metallic elements contained in these products may be toxic and are subject to regulatory controls. These elements can be emitted as airborne contaminants under certain processing conditions such as burning, melting, cutting, sawing, brazing, grinding, milling, machining.

Certain materials and equipment utilized in processing of this product (cutting/machining fluids, coatings, processing lubricants, cleaning/pickling chemicals, welding fluxes, torch and plasma cutting systems) may constitute a health hazard and should be treated accordingly.

EMERGENCY OVERVIEW: Odorless solid product in various forms, silver-gray color. This formed solid metal product poses little or no immediate health or fire hazards. Product may be coated - refer to appropriate coating MSDS for physical and health hazards. When product is subjected to welding, burning, melting, sawing, brazing, grinding, or other similar processes, potentially hazardous airborne particulate and fumes may be generated. These operations should be performed in well-ventilated areas, and if appropriate, respiratory protection and other PPE should be utilized.

PRIMARY ROUTE OF ENTRY: Inhalation of dust or fume during welding, burning, melting, cutting, brazing, grinding, machining and other operations.

NOTE: The composition of fumes from welding are dependent not only on the metal being welded, but also on the welding process and electrodes used. A full health hazard assessment should be performed by a competent health and safety professional for all welding and other operations performed on this product.

Acute Effects of Overexposure:

INHALATION:
- Exposures to high concentrations of metallic fumes or dusts may result in irritation of the respiratory tract and/or sensitization of the lungs and other mucous membranes.
- Excessive inhalation of fumes from many metals can produce an acute reaction known as "metal fume fever" (symptoms shown below under *SIGNS AND SYMPTOMS OF OVEREXPOSURE*).

EYE:
- Exposure to high concentrations of fumes or dusts may cause irritation and/or sensitization.

SKIN:
- Exposure to dust may cause irritation or sensitization, possibly leading to dermatitis.

INGESTION:
- Ingestion of harmful amounts of product as distributed is unlikely due to its solid, insoluble form. Ingestion of dust may cause nausea and/or vomiting. Serious effects may occur if large amounts of dust are swallowed.

Chronic Effects of Overexposure:

EXCESSIVE AND REPEATED EXPOSURES TO FUME OR DUST GENERATED DURING PROCESSING MAY CAUSE:
Allergic sensitization - dermatitis and asthma
- Lung inflammation and damage - pneumonitis, pneumonia, bronchitis, siderosis (benign lung disease caused by inhaling iron particles), diffuse pulmonary fibrosis
- Nasal perforation and nasal cavity damage
- Eye inflammation
- Central nervous system damage, possibly permanent
- Kidney Damage
- Liver damage
- Gout - inflammation of the joints (associated with some metals)

CARCINOGENICITY:
- The carcinogenicity of this solid product as a whole has not been tested.
- Individual components and some compounds of these elemental metals have been associated with carcinogenicity by NTP and IARC.
- No component greater than 0.1% by weight within this solid product is regulated by OSHA within 29 CFR 1910 Subpart Z as a carcinogen.

SYNERGISTIC MATERIALS: None known.

SIGNS AND SYMPTOMS OF OVEREXPOSURE:
- Redness, swelling, itching, and/or irritation of skin and eyes
- Respiratory difficulties - coughing, wheezing, shortness of breath, dyspnea, decreased pulmonary function
- Metal fume fever - symptoms consist of chills and fever (very similar and easily confused with flu symptoms), a metallic taste in the mouth, dryness, and irritation of the throat. The symptoms occur a few hours after excessive exposures and usually last from 12 to 48 hours. Long term effects from metal fume fever have not been noted in the literature.
- Central nervous system effects may show languor, sleepiness, weakness, emotional disturbances, spastic gait, paralysis.
- Kidney damage may be seen as changes in urine output and appearance, lower back pain, and edema (swelling from fluid retention).
- Liver damage may be seen by loss of appetite, jaundice (yellowish skin color) and occasional pain in the upper abdomen on the left side.
- Anorexia and weight loss

NOTE: For specific toxicological and other chronic effects information concerning the components of this solid steel product, *refer to **SECTION 11.0, TOXICOLOGICAL INFORMATION.***

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: For airborne fume and dust, preexisting diseases of the lungs, skin, eyes, and other mucous membranes.

4 - FIRST AID MEASURES

INHALATION: If overexposure occurs, immediately remove victim from the adverse environment to fresh air and seek medical attention. If breathing has stopped, certified individuals should perform CPR. Keep affected person warm and at rest.

EYE: Immediately flush with large amounts of running water for several minutes. Seek prompt medical attention.

SKIN: If dust gets on skin, wash contaminated area with soap and water. Remove and wash contaminated clothing. If a persistent rash or irritation occurs, seek medical attention.

INGESTION: Get medical attention immediately.

5 - FIRE FIGHTING MEASURES

FLASH POINT (Method Used): N/A
FLAMMABLE LIMITS: N/A
AUTOIGNITION TEMPERATURE: N/A
GENERAL FIRE HAZARD: None for solid formed product
FLAMMABILITY CLASSIFICATION: N/A

EXTINGUISHING METHOD: For solid formed product, as appropriate for surrounding fire. A fire involving finely divided particles should be treated as a Class D combustible metal fire. Fire should be extinguished by a properly trained and experienced firefighter. Proper care should be taken in applying extinguishing agent and in allowing to burn itself out.

FIRE FIGHTING EQUIPMENT: For solid formed product, as appropriate for surrounding fire. Positive pressure SCBA and structural firefighter's protective clothing should be used at a minimum for surrounding fire.

UNUSUAL FIRE OR EXPLOSION HAZARDS: This solid formed product does not constitute a fire or explosion hazard. Finely divided, suspended particulates may present a fire and explosion hazard in the presence of an ignition source. In addition, applied coatings may be combustible. For fires involving coated product, consult the appropriate coating MSDS.

Finely divided product (e.g. dust, shavings, etc.) may be combustible. May be ignited by heat, sparks, or flames. May burn rapidly with flare-burning effect. Fire may produce irritating or poisonous gases. High concentrations of airborne dust in an enclosed area can explode or burn if exposed to a source of ignition. Care should be taken to avoid the generation of airborne dust. Use of water on finely divided product may cause explosive hydrogen gas and heat to be evolved.

EXPLOSION DATA: *Sensitivity/Mechanical Impact*: N/A for solid product *Sensitivity/Static Discharge*: N/A for solid product

HAZARDOUS COMBUSTION PRODUCTS: N/A for solid formed product. Toxic metal and metallic oxide fumes may be evolved from fires involving finely divided particles and during torch-cutting operations.

6 - ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED: Minimal problems with spills of this product would occur because of its solid form. The following precautions apply to spills involving finely divided particles:

- Shut off ignition sources; no flares, smoking or flames should be in or near hazard area.
- Do not touch or walk through spilled material. Clean up using methods which avoid dust generation.
- Compressed air should not be used to clean up spills.
- During cleanup, skin and eye contact and inhalation of dust should be avoided as much as possible.
- Provide local exhaust or dilution ventilation as required.
- Appropriate PPE should be worn during cleanup if exposure limits are exceeded (*see SECTION 8, EXPOSURE CONTROLS/PERSONAL PROTECTION*).
- Collect material in compatible and appropriately labeled containers.
- For small dry spills, place material into clean dry container with a clean shovel, and cover loosely; move container from spill area.
- Comply with federal, state, and local regulations regarding reporting of spills and waste disposal.

7 - HANDLING AND STORAGE

HANDLING: Avoid breathing of and contact with fumes and dusts during processing. No specific requirements for solid formed product.

STORAGE: Keep away from incompatible materials (*see SECTION 10, STABILITY AND REACTIVITY*). No other specific storage procedures are required for solid formed product.

8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Local and/or general exhaust ventilation should be used to keep worker exposure below applicable exposure limits (*see SECTION 2, COMPOSITION/INFORMATION ON INGREDIENTS, for PELs and TLVs*) during welding, brazing, grinding, machining, and other processes which may generate airborne contaminants.

RESPIRATORY: When engineering or administrative controls cannot maintain exposures below permissible limits during welding, brazing, machining, and other processes which may generate airborne contaminants or while being instituted, use an appropriate NIOSH/MSHA approved respirator. If respiratory protection is required, all appropriate requirements as set forth in 29 CFR 1910.134 must be met. A competent health and safety professional should be consulted for respirator selection, fit testing, and training. Use a NIOSH-approved positive-pressure, air-supplied respirator if exposure levels are unknown, or any other circumstance where an air-purifying respirator would not be adequate.

GLOVES: Suitable for protection against physical injury and skin contact during handling and processing.

EYE: Safety glasses or goggles when there is a reasonable probability of flying particles or high levels of airborne dust or fume.

OTHER PROTECTIVE CLOTHING OR EQUIPMENT: Adequate footwear (safety shoes if necessary) and clothing that protects skin from prolonged or repeated contact. Change clothing if there is a reasonable probability of contamination.

9 - PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point: Ti-5930°F
Vapor Pressure (mm Hg, @ 68 °F): Negligible
Vapor Density (AIR = 1): N/A
Melting Point: Ti 3050°F
Appearance and Odor: Silver-gray metallic solid form, odorless
Specific Gravity (H_2O = 1): 4.5
Evaporation Rate: N/A
Solubility in water: Insoluble
pH: N/A

10 - STABILITY AND REACTIVITY

STABILITY: Stable under normal conditions of use, storage and transport for solid formed product.

CONDITIONS TO AVOID: Contact with incompatible materials. Avoid creating finely divided, concentrated airborne particulates in the presence of ignition sources.

INCOMPATIBLE MATERIALS: Oxidizers. Reacts with strong acids to form explosive hydrogen gas and heat.

HAZARDOUS DECOMPOSITION PRODUCTS: Extreme heat from fire or processing (e.g. welding, brazing, machining, etc.) may produce toxic or irritating airborne particulate, including metal and metallic oxide fumes. Reaction of some metals with water, steam, acids, etc. can evolve hydrogen, which is a highly dangerous fire and explosion hazard.

HAZARDOUS POLYMERIZATION: Will not occur

11 - TOXICOLOGICAL INFORMATION

Titanium: Elemental titanium and titanium dioxide is of a low order of toxicity. Laboratory animals (rats) exposed to titanium dioxide via inhalation have developed small localized areas of dark-colored dust deposits in the lungs. Excessive exposure in humans may result in slight changes in the lungs. LD50 (oral) - NIF; LC50 - NIF.

12 - ECOLOGICAL INFORMATION

N/A for solid product in its as shipped form. Articles produced from solid product are not an ecological hazard. NIF on specific product to establish its effect if released into the environment in finely divided form. It is believed that finely divided product, based on its components, will be hazardous to fish, animals, plants and the environment if released, the degree of which would depend on the particle size and quantity released. In addition, if particles are small enough, material may be ingested by wildlife, with possible toxic effects. The solid product is not expected to migrate easily into soil or groundwater based upon its insoluble form, however, finely divided material can become mobile in water and contaminate soil and groundwater. This material may persist in the environment for long periods, based upon its corrosion resistant, insoluble, and non-biodegradable properties. In addition, heavy metals may contaminate the food chain and ultimately be consumed by humans. Some components will react with oxygen to form metallic oxides; the rate of oxidation depends upon prevailing conditions. Metallic particulate discharged to a POTW may pass-through or contaminate sewage sludge, may interfere with the treatment system process, and may be non-compliant with a POTW permit or other regulations.

13 - DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD: If product as shipped becomes a solid waste, it would not be classified as a hazardous waste, and should be recycled. Product dusts from processing may be classified as a hazardous waste, depending on various properties of the dust (e.g. toxicity, solubility, flammability), which are defined further within 40 CFR 261 and possibly more restricting state and/or local regulations. Solid waste generated from product processing should be classified by a competent environmental professional and disposed, processed, or recycled in accordance with federal, state and local regulations.

14 - TRANSPORT INFORMATION

HAZARDOUS MATERIALS DESCRIPTION/PROPER SHIPPING NAME: N/A for solid formed product.

HAZARD CLASS: N/A for solid formed product.

IDENTIFICATION NO.: N/A for solid formed product.

15 - REGULATORY INFORMATION

SARA TITLE III HAZARD CATEGORIZATION: Product (dust and fume) is categorized as an immediate (acute) health hazard and a delayed (chronic) health hazard as defined by 40 CFR 370.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (EHSs): No components are listed as extremely hazardous substances.

SARA TITLE III SECTION 313 REPORTABLE SUBSTANCES: No components contained in this product existing as 0.1% or greater are subject to reporting requirements.

CERCLA HAZARDOUS SUBSTANCES: No components contained in this product existing as 0.1% or greater are subject to reporting requirements.

PENNSYLVANIA R-T-K LIST: No components contained in this product existing as 0.1% or greater are subject to reporting requirements.

NEW JERSEY R-T-K ENVIRONMENTAL HAZARDOUS SUBSTANCE LIST: No components contained in this product existing as 0.1% or greater are subject to reporting requirements.

CALIFORNIA PROPOSITION 65: Listed possible trace (much less than 0.1% by weight) elements known by the state to cause cancer - Arsenic (inorganic), Cadmium, Lead; Listed possible trace elements known by the state to cause reproductive toxicity - Lead; Listed components known by the state to cause cancer - Nickel, Cobalt (metal powder); Listed components known by the state to cause reproductive effects - None.

16 - OTHER INFORMATION

NFPA RATING (for solid formed product): **Health: 1** **Flammability: 0** **Reactivity: 0**

HMIS RATING (for solid formed product): **Health: 1** **Flammability: 0** **Reactivity: 0** **PPE: B**

ABBREVIATIONS/ACRONYMS:

ACGIH	- American Conference of Governmental Industrial Hygienists	NIF	- No Information Found
CAS	- Chemical Abstracts Service	NIOSH	- National Institute for Occupational Safety and Health
CFR	- Code of Federal Regulations	NTP	- National Toxicology Program
CPR	- Cardiopulmonary Resuscitation	OSHA	- Occupational Safety and Health Administration
EST	- Eastern Standard Time	PEL	- Permissible Exposure Limit
HMIS	- Hazardous Materials Identification System	PNOR	- Particulate Not Otherwise Regulated
IARC	- International Agency for Research on Cancer	PNOC	- Particulate Not Otherwise Classified
mg/m3	- milligram per cubic meter of air	POTW	- Publicly Owned Treatment Works
mppcf	- million particles per cubic foot	PPE	- Personal Protective Equipment
MSDS	- Material Safety Data Sheet	ppm	- parts per million
MSHA	- Mine Safety and Health Administration	SCBA	- Self-contained Breathing Apparatus
N/A	- Not Applicable	STEL	- Short-term Exposure Limit
NFPA	- National Fire Protection Association	TLV	- Threshold Limit Value
NIA	- No Information Available	TWA	- Time-weighted Average

NOTE: The percent composition in Section 2 reflects the range that is possible within this GROUP of products. These are not the technical specifications for a particular product.

DISCLAIMER: All information, recommendations, and suggestions appearing herein concerning the product are based upon data believed to be reliable. It is the user's responsibility to determine the safety, toxicity, and suitability for their own use of the product described herein. Since the actual use by others is beyond our control, no guarantee, expressed or implied is made by AM Health and Safety, Inc. (AMH&S-acting consultant) and Allegheny Ludlum as to the effects of such use, the results to be obtained, or the safety and toxicity of the product, nor does AMH&S or Allegheny Ludlum assume any liability arising out of use by others of the product referred to herein. AMH&S and Allegheny Ludlum shall not in any event be liable for special, incidental or consequential damages in connection with this MSDS. This MSDS is not intended as a license to operate under, or recommendation to infringe on, any patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

This information is not intended to serve as a complete regulatory compliance document. This information is offered as a guide to the MSDS user. No guarantees can be made whether the user will be in complete or correct compliance with all applicable regulations when this MSDS is used. It is the user's responsibility to comply with all federal, state, and local regulations.

PREPARED BY: AM Health and Safety, Inc. (acting consultant)	**REVISION NO.:** 11	**APPROVAL DATE:** September 15, 2004
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