



# MATERIAL SAFETY DATA SHEET

## 1. Product and Company Identification

**Material Name** NICKEL-CHROMIUM ALLOYS  
**MSDS Number** 1154  
**Chemical Formula** Mixture  
**Product use** Aerospace and industrial gas turbine applications  
**Synonym(s)** 226V, Alloy Y, AlResist 319, AM1, AM3, B1900, B1900+Hf, B1910, B1914, C101, C103, C103SC, C130, C242, C262, C263, C1023, CH22 LZR, CHS88U, CHS104, DS 1000, G39, GTD111, GTD222, GTD241, GTD444, GTD741 \* HA 236, Hastelloy C, Hastelloy X, How C, How W, How X, IN™ 100, IN™ 600, IN™ 625, IN™ 706, IN™ 713, IN™ 713C, IN™ 713LC, IN™ 718, IN™ 718 VPSD, IN™ 722, IN™ 738, IN™ 750X, IN™ 792, IN™ 792 Hf 0.5 \* IN™ 792 Hf 1, IN™ 792 Mod 5A, IN™ 901, IN™ 939, IN™ 939HAL, IN™ 6203, IN™ W, IN™ X, Inconel™ 706, Inconel™ 718, KH85, MA 6000E, MA 754, Mar-M™ 002, Mar-M™ 004, Mar-M™ 200, Mar-M™ 200 + 2% Hf \* Mar-M™ 246, Mar-M™ 247, Mar-M™ 247LC, Mar-M™ 421, Merl 76, MGA1400, MGA2400, MK4®, MK4HC®, Monoloy 454, NiCr, Nim90, Nimonic™ 75, Nimonic™ 80, Nimonic™ 90, NX 188, PD21, PE10, PT999, PWA 1475 \* Rene™ 41, Rene™ 77, Rene™ 80, Rene™ 80H, Rene™ 88, Rene™ 120, Rene™ 125, Rene™ 142, Rene™ 150, Rene™ 220, Rene™ N-2, Rene™ N-4, Rene™ N-4+, Rene™ N-5, Rene™ N-6, Rene™ N-500, Rene™ N-515 \* Rinsealoy, SC180, SC 1000, SC 2000, SCRY3, SCRY4, Sel 1, Sel 15, Siemet®, Turbo 25, U-500, U-700, Waspaloy and other nickel-chromium alloys \* \* IN™, Inconel™ and Nimonic™ are registered trademarks of Inco. \* Mar-M™ is a registered trademark of Martin Marietta. \* Rene™ is a registered trademark of GE Corporation.

### Manufacturer information

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### Website

For a current Material Safety Data Sheet, refer to Alcoa websites: [www.alcoa.com](http://www.alcoa.com) or Internally at [my.alcoa.com](http://my.alcoa.com) EHS Community

## 2. Hazards Identification

### Emergency overview

Solid. Metallic. Odorless. Non-combustible as supplied. Dust and fines from processing may be ignitable.

Explosion/fire hazards may be present when (See Sections 5, 7 and 10 for additional information):

- Heavily concentrated dust clouds are dispersed in the air.
- Molten metal is in contact with water/moisture.

Dust and fumes from processing: Can cause irritation of the eyes, skin and respiratory tract.

### Potential health effects

The following statements summarize the health effects generally expected in cases of overexposures. User specific situations should be assessed by a qualified individual. Additional health information can be found in Section 11.

The health effects listed below are not likely to occur unless processing of this product generates dusts or fumes.

**Eyes** Dust and fumes from processing: Can cause irritation.

**Skin** Dust and fumes from processing: Can cause irritation. Prolonged or repeated skin contact may cause sensitization and allergic contact dermatitis.

**Inhalation**

Health effects from mechanical processing (e.g., cutting, grinding): Dust: Can cause irritation of the upper respiratory tract. Chronic overexposures: Can cause respiratory sensitization, asthma, scarring of the lungs (pulmonary fibrosis), damage to the heart muscle (cardiomyopathy) and deformities of the joints.

Additional health effects from elevated temperature processing (e.g., welding, melting): Dust and fumes from processing: Can cause irritation of the respiratory tract. Acute overexposures: Can cause metal fume fever (nausea, chills, fever, shortness of breath and malaise). Chronic overexposures: Can cause the accumulation of fluid in the lungs (pulmonary edema), benign lung disease (siderosis) and lung cancer.

**Carcinogenicity and Reproductive Hazard**

Product as shipped: Does not present any cancer or reproductive hazards.  
 Dust from mechanical processing: Can present a cancer hazard (Nickel, Cobalt). Can present a reproductive hazard for males (Manganese).  
 Dust and fumes from welding or elevated temperature processing: Can present a cancer hazard (Nickel compounds, Cobalt compounds, Hexavalent chromium compounds, Titanium dioxide, Welding fumes). Can present a reproductive hazard for males (Manganese compounds).

**Medical conditions aggravated by exposure to product**

Dust and fumes from processing: Asthma, chronic lung disease, Secondary Parkinson's disease and skin rashes.

**3. Composition / Information on Ingredients**

**Composition comments** Complete composition is provided below and may include some components classified as non-hazardous.

Components	CAS #	Percent
Nickel	7440-02-0	40 - 82
Iron	7439-89-6	0 - 37
Chromium	7440-47-3	4 - 25
Cobalt	7440-48-4	0 - 24
Molybdenum	7439-98-7	0 - 24
Tungsten	7440-33-7	0 - 15
Tantalum	7440-25-7	0 - 12
Aluminum	7429-90-5	0 - 11
Niobium	7440-03-1	0 - 7
Rhenium	7440-15-5	0 - 6
Titanium	7440-32-6	0 - 6
Hafnium	7440-58-6	0 - 2
Vanadium	7440-62-2	0 - 2
Manganese	7439-96-5	0 - 1

**Additional Information** Additional compounds which may be formed during processing are listed in Section 8.

**4. First Aid Measures****First aid procedures****Eye contact**

Dust and fumes from processing: Rinse eyes with plenty of water or saline for at least 15 minutes. Consult a physician.

**Skin contact**

Dust and fumes from processing: Wash with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.

**Inhalation**

Dust and fumes from processing: Remove to fresh air. Check for clear airway, breathing, and presence of pulse. Provide cardiopulmonary resuscitation for persons without pulse or respirations. Consult a physician.

## 5. Fire Fighting Measures

### Flammable/Combustible Properties

This product does not present fire or explosion hazards as shipped. Dust and fines from processing may be ignitable.

### Fire / Explosion Hazards

May be a potential hazard under the following conditions:

- Heavily concentrated dust clouds are dispersed in the air. Dust or fines dispersed in the air can be explosive if subjected to a strong ignition source.
- Molten metal in contact with water/moisture. Moisture entrapped by molten metal can be explosive.

### Extinguishing media

#### Suitable extinguishing media

Use Class D extinguishing agents, fluxing salts or dry sand on fires involving dusts or fines. Otherwise, use fire fighting methods and materials that are appropriate for surrounding fire.

#### Unsuitable extinguishing media

DO NOT USE water in fighting fires around molten metal.

### Protection of firefighters

#### Protective equipment for firefighters

Fire fighters should wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing when appropriate.

## 6. Accidental Release Measures

### Spill or leak procedure

Avoid generating dust. Collect scrap for recycling. Pick up mechanically.

## 7. Handling and Storage

### Handling

Avoid generating dust. Avoid contact with sharp edges or heated metal. Do not eat, drink, apply cosmetics, or smoke when handling or using.

### Storage

Keep material dry.

### Requirements for Remelting of Scrap Material or Ingot

Molten metal and water can be an explosive combination. The risk is greatest when there is sufficient molten metal to entrap or seal off the water. Water and other forms of contamination on or contained in scrap or remelt ingot are known to have caused explosions in melting operations.

During melting operations, the following minimum guidelines should be observed:

- Inspect all materials prior to furnace charging and completely remove surface contamination such as water, ice, snow, deposits of grease and oil or other surface contamination resulting from weather exposure, shipment, or storage.
- Store materials in dry, heated areas with any cracks or cavities pointed downwards.

## 8. Exposure Controls / Personal Protection

### Engineering controls

Dust and fumes from processing: Use with adequate ventilation to meet the limits listed in Section 8.

### Exposure data

#### Compounds Formed During Processing

##### U.S. - OSHA - Specifically Regulated Chemicals

Chromium (VI) compounds (18540-29-9)

5 µg/m<sup>3</sup> TWA (Cancer hazard, See 29 CFR 1910.1026, Cr); 2.5 µg/m<sup>3</sup> Action Level (Cr)

### Occupational exposure limits

#### U.S. - OSHA

##### Components

Aluminum (7429-90-5)

##### Type

##### Value

##### Form

Chromium (7440-47-3)

Cobalt (7440-48-4)

Hafnium (7440-58-6)

Manganese (7439-96-5)

Molybdenum (7439-98-7)

Nickel (7440-02-0)

Tantalum (7440-25-7)

Vanadium (7440-62-2)

TWA

TWA (total dust)

TWA

TWA

Ceiling

TWA

TWA

Ceiling

Ceiling (V2O5, respirable dust)

5 mg/m<sup>3</sup>

15 mg/m<sup>3</sup>

1 mg/m<sup>3</sup>

0.1 mg/m<sup>3</sup>

0.5 mg/m<sup>3</sup>

5 mg/m<sup>3</sup>

15 mg/m<sup>3</sup>

1 mg/m<sup>3</sup>

5 mg/m<sup>3</sup>

0.1 mg/m<sup>3</sup>

0.5 mg/m<sup>3</sup>

(respirable fraction)

(total dust)

(dust and fume)

(fume)

(total dust)

(fume)

(total dust)

(fume)

(V2O5, fume)

(V2O5, respirable dust)

<b>Compounds Formed During Processing</b>	<b>Type</b>	<b>Value</b>	<b>Form</b>
Aluminum oxide (non-fibrous) (1344-28-1)	TWA	5 mg/m3	(respirable fraction)
	TWA (total dust)	15 mg/m3	(total dust)
Chromium (II) compounds (CASNo. Not available)	TWA	0.5 mg/m3	(Cr)
Chromium (III) compounds (CASNo. Not available)	TWA	0.5 mg/m3	(Cr)
Chromium (VI) compounds (18540-29-9)	Action	2.5 µg/m3	(as Cr)
	TWA (as Cr)	5 µg/m3	(as Cr)
Iron oxide (1309-37-1)	TWA	10 mg/m3	(fume)
Manganese compounds, inorganic (CASNo. Not available)	Ceiling	5 mg/m3	(Mn)
Molybdenum insoluble compounds (CASNo. Not available)	TWA	15 mg/m3	(total dust)
Nickel compounds, insoluble (CASNo. Not available)	TWA	1 mg/m3	(Ni)
Tantalum oxide (1314-61-0)	TWA	5 mg/m3	(dust)
Titanium dioxide (13463-67-7)	TWA	15 mg/m3	(total dust)
Vanadium pentoxide (1314-62-1)	Ceiling	0.1 mg/m3	(fume)
	Ceiling (respirable dust)	0.5 mg/m3	(respirable dust)

### **Alcoa**

<b>Components</b>	<b>Type</b>	<b>Value</b>	<b>Form</b>
Aluminum (7429-90-5)	TWA	3 mg/m3 10 mg/m3	(respirable fraction) (8 Hour)
Cobalt (7440-48-4)	TWA	0.02 mg/m3	(as Co)
Manganese (7439-96-5)	TWA	0.05 mg/m3 0.02 mg/m3	(total dust, as Mn) (respirable fraction, as Mn)

<b>Compounds Formed During Processing</b>	<b>Type</b>	<b>Value</b>	<b>Form</b>
Aluminum oxide (non-fibrous) (1344-28-1)	TWA	3 mg/m3 10 mg/m3	(respirable fraction) (8 Hour)
Chromium (VI) compounds (18540-29-9)	TWA	0.25 ug/m3	(as Cr)
Manganese compounds, inorganic (CASNo. Not available)	TWA	0.05 mg/m3 0.02 mg/m3	(total dust, as Mn) (respirable fraction, as Mn)
Nickel compounds, insoluble (CASNo. Not available)	TWA	0.1 mg/m3	(as Ni)

### **ACGIH**

<b>Components</b>	<b>Type</b>	<b>Value</b>	<b>Form</b>
Aluminum (7429-90-5)	TWA	1 mg/m3	(respirable fraction)
Chromium (7440-47-3)	TWA	0.5 mg/m3	
Cobalt (7440-48-4)	TWA	0.02 mg/m3	
Hafnium (7440-58-6)	TWA	0.5 mg/m3	
Manganese (7439-96-5)	TWA	0.2 mg/m3	
	TWA (inhalable fraction)	0.2 mg/m3	(inhalable fraction)
	TWA (respirable fraction)	0.02 mg/m3	(respirable fraction)
Molybdenum (7439-98-7)	TWA	3 mg/m3	(respirable fraction)
	TWA (inhalable fraction)	10 mg/m3	(inhalable fraction)
Nickel (7440-02-0)	TWA	1.5 mg/m3	(inhalable fraction)
Tantalum (7440-25-7)	TWA	5 mg/m3	(dust)
Tungsten (7440-33-7)	STEL	10 mg/m3	
	TWA	5 mg/m3	

<b>Compounds Formed During Processing</b>	<b>Type</b>	<b>Value</b>	<b>Form</b>
Aluminum oxide (non-fibrous) (1344-28-1)	TWA	1 mg/m3	(respirable fraction, as Al)
Chromium (III) compounds (CASNo. Not available)	TWA	0.5 mg/m3	(as Cr)
Chromium (VI) compounds, certain water insoluble forms (CASNo. Not available)	TWA	0.01 mg/m3	(as Cr)

Compounds Formed During Processing	Type	Value	Form
Chromium (VI) compounds, water soluble forms (CASNo. Not available)	TWA	0.05 mg/m <sup>3</sup>	(as Cr)
Hafnium compounds (CASNo. Not available)	TWA	0.5 mg/m <sup>3</sup>	(Hf)
Iron oxide (1309-37-1)	TWA	5 mg/m <sup>3</sup>	(respirable fraction)
Manganese compounds, inorganic (CASNo. Not available)	TWA	0.2 mg/m <sup>3</sup>	(Mn)
Molybdenum insoluble compounds (CASNo. Not available)	TWA (inhalable fraction, as Mo)	10 mg/m <sup>3</sup>	(inhalable fraction, as Mo)
	TWA (respirable fraction, as M)	3 mg/m <sup>3</sup>	
Nickel compounds, insoluble (CASNo. Not available)	TWA	0.2 mg/m <sup>3</sup>	(Ni, inhalable fraction)
Tantalum oxide (1314-61-0)	TWA	5 mg/m <sup>3</sup>	(Ta, dust)
Titanium dioxide (13463-67-7)	TWA	10 mg/m <sup>3</sup>	
Tungsten insoluble compounds (CASNo. Not available)	STEL	10 mg/m <sup>3</sup>	(W)
	TWA	5 mg/m <sup>3</sup>	(W)
Vanadium pentoxide (1314-62-1)	TWA (inhalable fraction, as V)	0.05 mg/m <sup>3</sup>	(inhalable fraction, as V)

### Personal protective equipment

<b>Eye / face protection</b>	Wear safety glasses with side shields.
<b>Skin protection</b>	Wear appropriate gloves to avoid any skin injury.
<b>Respiratory protection</b>	Dust and fumes from processing: Use NIOSH-approved respiratory protection as specified by an Industrial Hygienist or other qualified professional if concentrations exceed the limits listed in Section 8. Suggested respiratory protection: N95.

### General

Personnel who handle and work with molten metal should utilize primary protective clothing like polycarbonate face shields, fire resistant tapper's jackets, neck shades (snoods), leggings, spats and similar equipment to prevent burn injuries. In addition to primary protection, secondary or day-to-day work clothing that is fire resistant and sheds metal splash is recommended for use with molten metal. Synthetic materials should never be worn even as secondary clothing (undergarments).

## 9. Physical & Chemical Properties

<b>Form</b>	Solid.
<b>Appearance</b>	Metallic.
<b>Boiling point</b>	Not determined
<b>Melting point</b>	2652.8 °F (1456 °C) (Nickel)
<b>Flash point</b>	Not applicable
<b>Auto-ignition temperature</b>	Not applicable
<b>Flammability limits in air, lower, % by volume</b>	Not applicable
<b>Flammability limits in air, upper, % by volume</b>	Not applicable
<b>Vapor pressure</b>	Not applicable
<b>Vapor density</b>	Not applicable
<b>Solubility (water)</b>	Insoluble
<b>Density</b>	8.8 g/cm <sup>3</sup> (0.318 lb/in <sup>3</sup> )
<b>pH</b>	Not applicable
<b>Odor</b>	Odorless.
<b>Partition coefficient (n-octanol/water)</b>	Not applicable

## 10. Chemical Stability & Reactivity Information

<b>Chemical stability</b>	Stable under normal conditions of use, storage, and transportation.
<b>Conditions to avoid</b>	Molten metal can react violently/explosively with water or moisture, particularly when the water is entrapped. In powder form: This product may react with strong oxidizing agents.

**Hazardous polymerization** Will not occur.

## 11. Toxicological Information

### Health effects associated with ingredients

Nickel dust and fume: Can cause irritation of eyes, skin and respiratory tract. Eye contact: Can cause inflammation of the eyes and eyelids (conjunctivitis). Skin contact: Can cause sensitization and allergic contact dermatitis. Chronic overexposures: Can cause perforation of the nasal septum, inflammation of the nasal passages (sinusitis), respiratory sensitization, asthma and scarring of the lungs (pulmonary fibrosis). Nickel alloys IARC/NTP: Reviewed and not recommended for listing by NTP. Listed as possibly carcinogenic to humans by IARC (Group 2B).

Chromium dust and fumes: Can cause irritation of eye, skin and respiratory tract. Metallic chromium and trivalent chromium: Not classifiable as to their carcinogenicity to humans by IARC.

Cobalt: Can cause irritation of eyes, skin and respiratory tract. Skin contact: Can cause allergic reactions. Acute and chronic overexposures: Can cause respiratory sensitization, asthma, scarring of the lungs (pulmonary fibrosis) and damage to the heart muscle (cardiomyopathy). Listed as possibly carcinogenic to humans by IARC (Group 2B).

Molybdenum dust and fumes: Can cause irritation of mucous membranes, skin and respiratory tract. Acute overexposures: Can cause headache, backache and sore joints. Chronic overexposures: Can cause deformities of the joints, blood disorders, kidney damage, lung damage and liver damage.

Tungsten dust: Can cause irritation of eyes, skin and upper respiratory tract.

Tantalum and tantalum oxide: Can cause mechanical irritation of eyes, skin and upper respiratory tract. Generally of low toxicity.

Aluminum dust/fines and fumes: Low health risk by inhalation. Generally considered to be biologically inert (milling, cutting, grinding).

Niobium dust and fumes: Acute overexposures: Generally of low toxicity. Chronic overexposures: Can cause lung damage.

Titanium dioxide: Can cause irritation of eyes and respiratory tract. Chronic overexposures: Can cause chronic bronchitis. IARC/NTP: Listed as possibly carcinogenic to humans by IARC (Group 2B).

Manganese dust or fumes: Chronic overexposures: Can cause inflammation of the lung tissues, scarring of the lungs (pulmonary fibrosis), central nervous system damage, Secondary Parkinson's Disease and reproductive harm in males.

### Health effects associated with compounds formed during processing

Nickel compounds: Associated with lung cancer, cancer of the vocal cords and nasal cancer. IARC/NTP: Listed as "known to be a human carcinogen" by the NTP. Listed as carcinogenic to humans by IARC (Group 1).

Iron oxide: Chronic overexposures: Can cause benign lung disease (siderosis). Ingestion: Can cause irritation of gastrointestinal tract, bleeding, changes in the pH of the body fluids (metabolic acidosis) and liver damage.

Hexavalent chromium compounds (Chromium VI): Can cause irritation of eye, skin and respiratory tract. Skin contact: Can cause irritant dermatitis, allergic reactions and skin ulcers. Chronic overexposures: Can cause perforation of the nasal septum, respiratory sensitization, asthma, the accumulation of fluid in the lungs (pulmonary edema), lung damage, kidney damage, lung cancer, nasal cancer and cancer of the gastrointestinal tract. IARC/NTP: Listed as "known to be a human carcinogen" by the NTP. Listed as carcinogenic to humans by IARC (Group 1).

Chromium (III) compounds: Can cause irritation of eye, skin and respiratory tract. IARC/NTP: Not classifiable as to their carcinogenicity to humans by IARC.

Molybdenum trioxide: Can cause irritation of eyes, mucous membranes and upper respiratory tract. Chronic overexposures: Can cause reduction in the number of red blood cells (anemia), predisposition to gout, thyroid function changes, liver damage and lung damage. Additional information: Studies with experimental animals by inhalation have found lung cancer.

Alumina (aluminum oxide): Low health risk by inhalation. Generally considered to be biologically inert.

Titanium dioxide: Can cause irritation of eyes and respiratory tract. Chronic overexposures: Can cause chronic bronchitis. IARC/NTP: Listed as possibly carcinogenic to humans by IARC (Group 2B).

Vanadium pentoxide: Can cause irritation of eyes, skin and respiratory tract. Skin contact (prolonged or repeated): Can cause sensitization and dermatitis. Acute overexposures: Can cause inflammation of the eyes and eyelids (conjunctivitis), bronchitis and fluid in the lungs (pulmonary edema). Effects can be delayed up to 3 days. Chronic overexposures: Can cause kidney damage, blindness, asthma and emphysema. IARC/NTP: Listed as possibly carcinogenic to humans by IARC (Group 2B).

Manganese oxide fumes: Can cause irritation of the eyes, skin, and respiratory tract. Acute overexposures: Can cause metal fume fever (nausea, fever, chills, shortness of breath and malaise).

**Component analysis - LD50** No information available for product.

## Components

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### Toxicology Data - Selected LD50s and LC50s

Cobalt (7440-48-4)	Inhalation LC50 Rat >10 mg/L 1 h; Oral LD50 Rat 6170 mg/kg
Iron (7439-89-6)	Oral LD50 Rat 984 mg/kg
Manganese (7439-96-5)	Oral LD50 Rat 9 g/kg
Nickel (7440-02-0)	Oral LD50 Rat >9000 mg/kg

### Compounds Formed During Processing

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### Toxicology Data - Selected LD50s and LC50s

Aluminum oxide (non-fibrous) (1344-28-1)	Oral LD50 Rat >5000 mg/kg
Iron oxide (1309-37-1)	Oral LD50 Rat >10000 mg/kg
Tantalum oxide (1314-61-0)	Oral LD50 Rat 8 g/kg
Titanium dioxide (13463-67-7)	Oral LD50 Rat >10000 mg/kg
Vanadium pentoxide (1314-62-1)	Inhalation LC50 Rat 2.21 mg/L 4 h; Oral LD50 Rat 10 mg/kg; Dermal LD50 Rat >2500 mg/kg

**Carcinogenicity** No information available for product.

## Components

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### ACGIH - Threshold Limit Values - Carcinogens

Aluminum (7429-90-5)	A4 - Not Classifiable as a Human Carcinogen
Chromium (7440-47-3)	A4 - Not Classifiable as a Human Carcinogen
Cobalt (7440-48-4)	A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans
Nickel (7440-02-0)	A5 - Not Suspected as a Human Carcinogen

### IARC - Group 2B (Possibly Carcinogenic to Humans)

Cobalt (7440-48-4)	Monograph 86 [2006] (without tungsten carbide); Monograph 52 [1991]
Nickel (7440-02-0)	Monograph 49 [1990]; Supplement 7 [1987]

### Compounds Formed During Processing

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### ACGIH - Threshold Limit Values - Carcinogens

Aluminum oxide (non-fibrous) (1344-28-1)	A4 - Not Classifiable as a Human Carcinogen
Chromium (III) compounds (CASNo. Not available)	A4 - Not Classifiable as a Human Carcinogen
Chromium (VI) compounds, certain water insoluble forms (CASNo. Not available)	A1 - Confirmed Human Carcinogen
Chromium (VI) compounds, water soluble forms (CASNo. Not available)	A1 - Confirmed Human Carcinogen
Iron oxide (1309-37-1)	A4 - Not Classifiable as a Human Carcinogen
Nickel compounds, insoluble (CASNo. Not available)	A1 - Confirmed Human Carcinogen
Titanium dioxide (13463-67-7)	A4 - Not Classifiable as a Human Carcinogen
Vanadium pentoxide (1314-62-1)	A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

### IARC - Group 1 (Carcinogenic to Humans)

Chromium (VI) compounds (18540-29-9)	Monograph 49 [1990] (evaluated as a group)
Nickel compounds, insoluble (CASNo. Not available)	Monograph 49 [1990] (evaluated as a group)

### IARC - Group 2B (Possibly Carcinogenic to Humans)

Titanium dioxide (13463-67-7)	Monograph 93 [in preparation]; Monograph 47 [1989]
Vanadium pentoxide (1314-62-1)	Monograph 86 [2006]

## Compounds Formed During Processing

### NTP (National Toxicology Program) - Report on Carcinogens - Known Human Carcinogens

Chromium (VI) compounds (18540-29-9) Known Human Carcinogen  
Nickel compounds, insoluble (CASNo. Not available) Known Human Carcinogen

### U.S. - OSHA - Specifically Regulated Carcinogens (1910.1001 to 1910.1096)

Chromium (VI) compounds (18540-29-9) Workers exposed to Cr(VI) are at an increased risk of developing lung cancer - see 29 CFR 1910.1026

## 12. Ecological Information

### Ecotoxicity

#### Components

##### Ecotoxicity - Freshwater Algae Data

Nickel (7440-02-0) 72 Hr EC50 Pseudokirchneriella subcapitata: 0.18 mg/L; 96 Hr EC50 Pseudokirchneriella subcapitata: 0.174 - 0.311 mg/L [static]

##### Ecotoxicity - Freshwater Fish Species Data

Cobalt (7440-48-4) 96 Hr LC50 Brachydanio rerio: >100 mg/L [static]  
Iron (7439-89-6) 96 Hr LC50 Morone saxatilis: 13.6 mg/L [static]; 96 Hr LC50 Cyprinus carpio: 0.56 mg/L [semi-static]  
Nickel (7440-02-0) 96 Hr LC50 Brachydanio rerio: >100 mg/L; 96 Hr LC50 Cyprinus carpio: 1.3 mg/L [semi-static]; 96 Hr LC50 Cyprinus carpio: 10.4 mg/L [static]

##### Ecotoxicity - Water Flea Data

Nickel (7440-02-0) 48 Hr EC50 Daphnia magna: >100 mg/L; 48 Hr EC50 Daphnia magna: 1 mg/L [Static]

#### Compounds Formed During Processing

##### Ecotoxicity - Freshwater Fish Species Data

Chromium (VI) compounds (18540-29-9) 96 Hr LC50 Pimephales promelas: 36.2 mg/L; 96 Hr LC50 Oncorhynchus mykiss: 7.6 mg/L

##### Ecotoxicity - Water Flea Data

Chromium (VI) compounds (18540-29-9) 24 Hr EC50 water flea: 435 µg/L

**Environmental Fate** No data available for product.

## 13. Disposal Considerations

**Disposal instructions** Reuse or recycle material whenever possible. If reuse or recycling is not possible, disposal must be made according to local or governmental regulations.

**Waste codes** RCRA Status: Not federally regulated in the U.S. if disposed of "as is."  
RCRA waste codes other than described here may apply depending on use of the product. Status must be determined at the point of waste generation. Refer to 40 CFR 261 or state equivalent in the U.S. TCLP testing is recommended for Chromium.

## 14. Transport Information

### General Shipping Information

#### Basic shipping description:

**UN number** -  
**Proper shipping name** Not regulated  
**Hazard class** -  
**Packing group** -

### General Shipping Notes

- When "Not regulated", enter the proper freight classification, MSDS Number and Product Name onto the shipping paperwork.

## 15. Regulatory Information

**US federal regulations** In reference to Title VI of the Clean Air Act of 1990, this material does not contain nor was it manufactured using ozone-depleting chemicals.



## Components

### U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities

Chromium (7440-47-3)	5000 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is larger than 100 micrometers); 2270 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is larger than 100 micrometers)
Nickel (7440-02-0)	100 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is larger than 100 micrometers); 45.4 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is larger than 100 micrometers)

### U.S. - CERCLA/SARA - Section 313 - Emission Reporting

Aluminum (7429-90-5)	1.0 % de minimis concentration (dust or fume only)
Chromium (7440-47-3)	1.0 % de minimis concentration
Cobalt (7440-48-4)	0.1 % de minimis concentration
Manganese (7439-96-5)	1.0 % de minimis concentration
Nickel (7440-02-0)	0.1 % de minimis concentration
Vanadium (7440-62-2)	1.0 % de minimis concentration (except when contained in an alloy)

## State regulations

### Components

#### U.S. - California - 8 CCR Section 339 - Director's List of Hazardous Substances

Aluminum (7429-90-5)	Present
Chromium (7440-47-3)	Present
Cobalt (7440-48-4)	Present (exempt when encapsulated in a capsule which meets the definition of Special Form Materials prescribed in 49 CFR 173.403(z))
Hafnium (7440-58-6)	Present
Iron (7439-89-6)	Present
Manganese (7439-96-5)	Present
Molybdenum (7439-98-7)	Present
Nickel (7440-02-0)	Present
Tantalum (7440-25-7)	Present
Tungsten (7440-33-7)	Present
Vanadium (7440-62-2)	Present

#### U.S. - California - Proposition 65 - Carcinogens List

Cobalt (7440-48-4)	carcinogen, initial date 7/1/92 (powder)
Nickel (7440-02-0)	carcinogen, initial date 10/1/89

#### U.S. - Massachusetts - Right To Know List

Aluminum (7429-90-5)	Present
Chromium (7440-47-3)	Carcinogen; Extraordinarily hazardous
Cobalt (7440-48-4)	Present
Hafnium (7440-58-6)	Present
Manganese (7439-96-5)	Present
Molybdenum (7439-98-7)	Present
Nickel (7440-02-0)	Carcinogen; Extraordinarily hazardous
Tantalum (7440-25-7)	Present
Tungsten (7440-33-7)	Present
Vanadium (7440-62-2)	Present (dust and fume)

#### U.S. - Minnesota - Hazardous Substance List

Aluminum (7429-90-5)	Present (dust)
Chromium (7440-47-3)	Present
Cobalt (7440-48-4)	Present (dust and fume)
Hafnium (7440-58-6)	Present
Manganese (7439-96-5)	Present
Molybdenum (7439-98-7)	Present
Nickel (7440-02-0)	Carcinogen
Tantalum (7440-25-7)	Present
Tungsten (7440-33-7)	Present

#### U.S. - New Jersey - Right to Know Hazardous Substance List

Aluminum (7429-90-5)	sn 0054
Chromium (7440-47-3)	sn 0432
Cobalt (7440-48-4)	sn 0520
Hafnium (7440-58-6)	sn 0967
Manganese (7439-96-5)	sn 1155 (dust and fume)

## State regulations

### Components

#### U.S. - New Jersey - Right to Know Hazardous Substance List

Molybdenum (7439-98-7)	sn 1309
Nickel (7440-02-0)	sn 1341 (dust and fume)
Tantalum (7440-25-7)	sn 1775
Tungsten (7440-33-7)	sn 1959
Vanadium (7440-62-2)	sn 3762

#### U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances

Chromium (7440-47-3)	Present
Nickel (7440-02-0)	Present

#### U.S. - Pennsylvania - RTK (Right to Know) List

Aluminum (7429-90-5)	Environmental hazard
Chromium (7440-47-3)	Environmental hazard; Special hazardous substance
Cobalt (7440-48-4)	Environmental hazard
Hafnium (7440-58-6)	Present
Manganese (7439-96-5)	Environmental hazard
Molybdenum (7439-98-7)	Present
Nickel (7440-02-0)	Environmental hazard; Special hazardous substance
Tantalum (7440-25-7)	Present
Tungsten (7440-33-7)	Present
Vanadium (7440-62-2)	Environmental hazard

## Superfund Amendments and Reauthorization Act of 1986 (SARA)

### Hazard categories

Immediate Hazard - Yes, If particulates/fumes generated during processing.  
Delayed Hazard - Yes, If particulates/fumes generated during processing.  
Fire Hazard - No  
Pressure Hazard - No  
Reactivity Hazard - No

## Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of New and Existing Chemicals (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	No
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

## Inventory information

Japan - ENCS Inventory: Pure metals are not specifically listed by CAS or ENCS number. The class of compounds for each of these metals is listed on the ENCS inventory.

## 16. Other Information

### MSDS History

Origination date: August 17, 2001  
Supersedes: June 4, 2008  
Revision date: March 11, 2010

**MSDS Status** March 11, 2010: New format.  
June 4, 2008: Reviewed on a periodic basis in accordance with Alcoa policy. Change(s) in Section: 1, 2, 3, 4, 5, 8, 11, 12, 13, 14 and 15  
October 12, 2004: Combined with Alcoa MSDS No. 1155. Change(s) in Section: 1, 2, 3, 8 and 15. Covers some Howmet products formerly on Howmet MSDSs 103A, 107A, 108A, 120A, 121A, 123A, 126A, 127A, 128A, 130A, 131A, 132A, 504 and 505.  
August 17, 2001: New MSDS: Covers some products formerly on Alcoa MSDS 1040 and Howmet MSDSs 101A, 102A, 106A and 122A.

**Prepared By** Hazardous Materials Control Committee  
Preparer: Jon N. Peace, 412-553-2293/Robert W. Barr, 412-553-2618/Jim Perriello, 480-278-6928

**MSDS System Number** 159308

**Other information**

- Guide to Occupational Exposure Values 2009, Compiled by the American Conference of Governmental Industrial Hygienists (ACGIH).
- Documentation of the Threshold Limit Values and Biological Exposure Indices, Sixth Edition, 1991, Compiled by the American Conference of Governmental Industrial Hygienists, Inc. (ACGIH).
- NIOSH Pocket Guide to Chemical Hazards, U.S. Department of Health and Human Services, February 2004.
- Dangerous Properties of Industrial Materials, Sax, N. Irving, Van Nostrand Reinhold Co., Inc., 1984.
- Patty's Industrial Hygiene and Toxicology: Volume II: Toxicology, 4th ed., 1994, Patty, F. A.; edited by Clayton, G. D. and Clayton, F. E.: New York: John Wiley & Sons, Inc.
- expub, Expert Publishing, LLC., www.expub.com

Key/Legend:

ACGIH American Conference of Governmental Industrial Hygienists  
AICS Australian Inventory of Chemical Substances  
CAS Chemical Abstract Services  
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act  
CFR Code of Federal Regulations  
CPR Cardio-pulmonary Resuscitation  
DOT Department of Transportation  
DSL Domestic Substances List (Canada)  
EC Effective Concentration  
ED Effective Dose  
EINECS European Inventory of Existing Commercial Chemical Substances  
ENCS Japan - Existing and New Chemical Substances  
EWC European Waste Catalogue  
EPA Environmental Protective Agency  
IARC International Agency for Research on Cancer  
LC Lethal Concentration  
LD Lethal Dose  
MAK Maximum Workplace Concentration (Germany) "maximale Arbeitsplatz-Konzentration"  
NDSL Non-Domestic Substances List (Canada)  
NIOSH National Institute for Occupational Safety and Health  
NTP National Toxicology Program  
OEL Occupational Exposure Limit  
OSHA Occupational Safety and Health Administration  
PIN Product Identification Number  
PMCC Pensky Marten Closed Cup  
RCRA Resource Conservation and Recovery Act  
SARA Superfund Amendments and Reauthorization Act  
SIMDUT Système d'Information sur les Matières Dangereuses Utilisées au Travail  
STEL Short Term Exposure Limit  
TCLP Toxic Chemicals Leachate Program  
TDG Transportation of Dangerous Goods  
TLV Threshold Limit Value  
TSCA Toxic Substances Control Act  
TWA Time Weighted Average  
WHMIS Workplace Hazardous Materials Information System  
m meter, cm centimeter, mm millimeter, in inch,  
g gram, kg kilogram, lb pound, µg microgram,  
ppm parts per million, ft feet

\*\*\* End of MSDS \*\*\*

**Disclaimer** The information in the sheet was written based on the best knowledge and experience currently available.

# NICKEL-CHROMIUM ALLOYS

## CAUTION

Non-combustible as supplied. Dust and fines from processing may be ignitable.

Explosion/fire hazards may be present when:

Heavily concentrated dust clouds are dispersed in the air. Molten metal is in contact with water/moisture.

Dust and fumes from processing: Can cause irritation of the eyes, skin and respiratory tract.

Chronic overexposures: Can cause respiratory sensitization, asthma, scarring of the lungs, damage to the heart muscle and deformities of the joints.

Additional health effects from elevated temperature processing (e.g., welding, melting): Acute overexposures: Can cause metal fume fever. Chronic overexposures: Can cause the accumulation of fluid in the lungs, benign lung disease and lung cancer.

### FIRST AID

**Eye contact** Dust and fumes from processing: Rinse eyes with plenty of water or saline for at least 15 minutes. Consult a physician.

**Skin contact** Dust and fumes from processing: Wash with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.

**Inhalation** Dust and fumes from processing: Remove to fresh air. Check for clear airway, breathing, and presence of pulse. Provide cardiopulmonary resuscitation for persons without pulse or respirations. Consult a physician.

### FIRE FIGHTING

**Suitable extinguishing media** Use Class D extinguishing agents, fluxing salts or dry sand on fires involving dusts or fines. Otherwise, use fire fighting methods and materials that are appropriate for surrounding fire.

**Extinguishing media which must not be used for safety reasons** DO NOT USE water in fighting fires around molten metal.

### SPILL PROCEDURES

**Spill or leak procedure** Avoid generating dust. Collect scrap for recycling. Pick up mechanically.

### HANDLING AND STORAGE

**Handling** Avoid generating dust. Avoid contact with sharp edges or heated metal. Do not eat, drink, apply cosmetics, or smoke when handling or using.

**Storage** Keep material dry.

See Alcoa Material Safety Data Sheet No. 1154 for more information about use and disposal.  
Emergency Phone: (412) 553-4001.

### Contains:

Nickel	7440-02-0
Iron	7439-89-6
Chromium	7440-47-3
Cobalt	7440-48-4
Molybdenum	7439-98-7
Tungsten	7440-33-7
Tantalum	7440-25-7
Aluminum	7429-90-5
Niobium	7440-03-1
Rhenium	7440-15-5
Titanium	7440-32-6
Hafnium	7440-58-6
Vanadium	7440-62-2
Manganese	7439-96-5

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