



# MATERIAL SAFETY DATA SHEET

## 1. Product and Company Identification

<b>Material Name</b>	<b>NICKEL ALUMINIDE COATINGS</b>
<b>MSDS Number</b>	1177
<b>CAS Number</b>	Mixture
<b>Product use</b>	Diffuse coatings on Superalloy castings
<b>Synonym(s)</b>	MDC 1, MDC 15, MDC 210, MDC 701, Codep, C19, C30, C31, C32, C39, (Refer to Alcoa MSDS Nos. 1153, 1154, and 1156 for additional information on the Superalloys.)
<b>Manufacturer/supplier information</b>	Alcoa Inc. 201 Isabella Street Pittsburgh, PA 15212-5858 US Health and Safety Email: accmsds@alcoa.com Health and Safety Fax: +412-553-4822 Health and Safety Tel: +412-553-4649  Howmet Thermatech Coating 555 Benston Road Whitehall, MI 49461 Tel: +1-231-894-5686  Howmet Turbine Components Coating 4 Commercial Street Branford, CT 06405-2801 Tel: +1-203-315-6100
<b>Emergency Information</b>	USA: Chemtrec: +1-703-527-3887 +1-800-424-9300 (24 Hour Emergency Telephone, multiple languages spoken); ALCOA: +1-412-553-4001 (24 Hour Emergency Telephone, only English spoken)
<b>Website</b>	For a current Material Safety Data Sheet, refer to Alcoa websites: <a href="http://www.alcoa.com">www.alcoa.com</a> or internally at <a href="http://my.alcoa.com">my.alcoa.com</a> EHS Community

## 2. Hazards Identification

**Emergency overview** Solid. Gray. 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.

Health effects from mechanical processing (e.g., cutting, grinding): Dust: Can cause irritation of the eyes, skin and upper respiratory tract.

### Potential health effects

These coatings are deposited by various processes onto the surface of Superalloy castings. Occupational exposures would be limited to skin contact unless processing occurs which generates dusts (e.g., cutting or grinding). Under those conditions, exposures could also include components of the Superalloys.

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.

**Eyes** Dust from processing: Can cause irritation and inflammation of the eyes and eyelids.

**Skin** Dust 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, scarring of the lungs (pulmonary fibrosis) and damage to the heart muscle (cardiomyopathy).

**Carcinogenicity and Reproductive Hazard** Product as shipped: Does not present any cancer or reproductive hazards.  
Dust from mechanical processing: Can present a cancer hazard (Cobalt, Nickel). Does not present any reproductive hazards.

**Medical conditions aggravated by exposure to product** Dust from processing: Asthma, chronic lung 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	45 - 60
Aluminum	7429-90-5	27 - 40
Cobalt	7440-48-4	0 - 15
Chromium	7440-47-3	1 - 6

**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 from processing: Rinse eyes with plenty of water or saline for at least 15 minutes. Consult a physician.
- Skin contact** Dust from processing: Wash with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.
- Inhalation** Dust from processing: Remove to fresh air. Check for clear airway, breathing, and presence of pulse. If breathing is difficult, provide oxygen. Loosen any tight clothing on neck or chest. 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** Explosion/fire hazards may be present when:  
• Heavily concentrated dust clouds are dispersed in the air.

#### 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

- Personal precautions** See Section 8 of the MSDS for Personal Protective Equipment.
- Environmental precautions** No specific precautions.
- Spill or leak procedure** Avoid generating dust. Pick up mechanically. Collect scrap for recycling.
- Evacuation procedures** None necessary.
- Methods for cleaning up** Use mechanical handling equipment. Spillage should be collected for recycling.

### 7. Handling and Storage

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

### 8. Exposure Controls / Personal Protection

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

#### Occupational exposure limits

##### U.S. - OSHA

Components	Type	Value	Form
Aluminum (7429-90-5)	TWA	5 mg/m <sup>3</sup>	(respirable fraction)

Components	Type	Value	Form
Chromium (7440-47-3)	TWA	15 mg/m <sup>3</sup>	(total dust)
Cobalt (7440-48-4)	TWA	1 mg/m <sup>3</sup>	(dust and fume)
Nickel (7440-02-0)	TWA	0.1 mg/m <sup>3</sup>	
Nickel (7440-02-0)	TWA	1 mg/m <sup>3</sup>	

#### Alcoa

Components	Type	Value	Form
Aluminum (7429-90-5)	TWA	3 mg/m <sup>3</sup>	(respirable fraction)
		10 mg/m <sup>3</sup>	(inhalable)
Cobalt (7440-48-4)	TWA	0.02 mg/m <sup>3</sup>	(8 Hour)

#### ACGIH

Components	Type	Value	Form
Aluminum (7429-90-5)	TWA	1 mg/m <sup>3</sup>	(respirable fraction)
Chromium (7440-47-3)	TWA	0.5 mg/m <sup>3</sup>	
Cobalt (7440-48-4)	TWA	0.02 mg/m <sup>3</sup>	(as Co)
Nickel (7440-02-0)	TWA	1.5 mg/m <sup>3</sup>	(inhalable fraction)

#### Personal protective equipment

**Eye / face protection** Safety glasses with full side shields or goggles recommended.

**Skin protection** Wear appropriate gloves to avoid any skin injury.

**Respiratory protection** Dust 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.

### 9. Physical & Chemical Properties

<b>Form</b>	Solid.
<b>Color</b>	Gray.
<b>Boiling point</b>	Not determined
<b>Melting point</b>	Not determined
<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> (549.384 lb/ft <sup>3</sup> ) for Superalloy
<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>	None known.
<b>Incompatible materials</b>	In powder form: Strong oxidizers (chlorine, perchlorates, permanganates, peroxides, nitric acid, chromates, etc.).
<b>Hazardous decomposition products</b>	None known.
<b>Possibility of hazardous reactions</b>	None known.

**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).

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

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). IARC/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.

### Health effects associated with compounds formed during processing

No new/additional compounds are expected to be formed during processing.

**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
Nickel (7440-02-0)	Oral LD50 Rat >9000 mg/kg

**Carcinogenicity** Dust from processing: Possible human carcinogen Contains nickel, which can cause lung or nasal cancer. Long-term breathing of this material may cause chronic lung disease.

#### 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]

## 12. Ecological Information

**General Product Information** No information available for product.

### Ecotoxicity

#### Components

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##### Ecotoxicity - Freshwater Algae - Acute Toxicity 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]
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##### Ecotoxicity - Freshwater Fish - Acute Toxicity Data

Cobalt (7440-48-4)	96 Hr LC50 Brachydanio rerio: >100 mg/L [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 - Acute Toxicity Data

Nickel (7440-02-0)	48 Hr EC50 Daphnia magna: >100 mg/L; 48 Hr EC50 Daphnia magna: 1 mg/L [Static]
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**Environmental Fate** No data available for product.

## 13. Disposal Considerations

<b>Disposal instructions</b>	Reuse or recycle material whenever possible. If reuse or recycling is not possible, disposal must be made according to local or governmental regulations.
<b>Waste codes</b>	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:

<b>UN number</b>	-
<b>Proper shipping name</b>	Not regulated
<b>Hazard class</b>	-
<b>Packing group</b>	-

### General Shipping Notes

- Material is not in powder form and is only shipped as an integral part of casting to which it has already been applied.
- When "Not regulated", enter the proper freight classification, MSDS Number and Product Name onto the shipping paperwork.

## 15. Regulatory Information

<b>US federal regulations</b>	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.
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### Components

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#### 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
Nickel (7440-02-0)	0.1 % de minimis concentration

<b>State regulations</b>	WARNING: This product contains a chemical known to the State of California to cause cancer.
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### Components

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#### 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))
Nickel (7440-02-0)	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
Nickel (7440-02-0)	Carcinogen; Extraordinarily hazardous

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

Aluminum (7429-90-5)	Present (dust)
Chromium (7440-47-3)	Present

## Components

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

Cobalt (7440-48-4) Present (as Co, dust and fume)  
Nickel (7440-02-0) Carcinogen (as Ni)

### 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  
Nickel (7440-02-0) sn 1341 (dust and fume)

### 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  
Nickel (7440-02-0) Environmental hazard; Special hazardous substance

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

### Hazard categories

Immediate Hazard - Yes, If particulates are generated during processing.  
Delayed Hazard - Yes, If particulates are 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)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
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)	Yes
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
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: October 3, 2001  
Supersedes: June 9, 2008  
Revision date: June 23, 2011

### MSDS Status

June 23, 2011: New format.  
June 9, 2008: Reviewed on a periodic basis in accordance with Alcoa policy. Change(s) in Section: 1, 2, 3, 4, 8, 11, 12, 13, 14 and 15.  
October 28, 2004: Reviewed on a periodic basis in accordance with Alcoa policy. Change(s) in Section: 1.  
March 30, 2004: Change(s) in Section: 1, 8 and 15.  
October 3, 2001: New MSDS: Replaces Howmet MSDSs 805, 806, and 807.

### Prepared By

Hazardous Materials Control Committee  
Preparer: Jim Perriello, +1-480-278-6928/Jon N. Peace, +1-412-553-2293

### MSDS System Number

160699

## Other information

- Guide to Occupational Exposure Values 2010, Compiled by the American Conference of Governmental Industrial Hygienists (ACGIH).
- NIOSH Pocket Guide to Chemical Hazards, U.S. Department of Health and Human Services, September 2005.
- expub, Expert Publishing, LLC., www.expub.com
- Aluminum Association's Bulletin F-1, "Guidelines for Handling Aluminum Fines Generated During Various Aluminum Fabricating Operations." The Aluminum Association, 1525 Wilson Boulevard, Suite 600, Arlington, Virginia 22209, www.aluminum.org.
- Aluminum Association, "Guidelines for Handling Molten Aluminum, The Aluminum Association, 1525 Wilson Boulevard, Suite 600, Arlington, Virginia 22209, www.aluminum.org.
- NFPA 484, Standard for Combustible Metals (NFPA phone: 800-344-3555)
- NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids
- NFPA 70, Standard for National Electrical Code (Electrical Equipment, Grounding and Bonding)
- NFPA 77, Standard for Static Electricity

### 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 ALUMINIDE COATINGS

## WARNING

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.

Health effects from mechanical processing (e.g., cutting, grinding): Dust: Can cause irritation of the eyes, skin and upper respiratory tract. Prolonged or repeated skin contact may cause sensitization and allergic contact dermatitis. Chronic overexposures: Can cause respiratory sensitization, scarring of the lungs and damage to the heart muscle.

### FIRST AID

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

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

**Inhalation** Dust from processing: Remove to fresh air. Check for clear airway, breathing, and presence of pulse. If breathing is difficult, provide oxygen. Loosen any tight clothing on neck or chest. 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. Pick up mechanically. Collect scrap for recycling.

### HANDLING AND STORAGE

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

See Alcoa Material Safety Data Sheet No. 1177 for more information about use and disposal.  
Emergency Phone: +1-412-553-4001.

### Contains:

Nickel	7440-02-0
Aluminum	7429-90-5
Cobalt	7440-48-4
Chromium	7440-47-3