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Version 5

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product Identifier

Product name Titanium Alloy Briquettes
Synonyms Made with titanium metal powder produced using the Armstrong Process® technology

Recommended use of the chemical and restrictions on use

Recommended Use Production of titanium metal components.
Uses advised against For use in industrial installations only

Details of the supplier of the safety data sheet

Manufacturer Address Cristal Metals Inc.
1501 Titanium Drive
Ottawa, IL 61350
+1.815.431.4340

For further information, please contact

E-mail address Regulatory.query@cristal.com

24 Hour Emergency Phone Number

Emergency telephone Chemtrec (USA) 1-800-424-9300

2. HAZARDS IDENTIFICATION

Classification

The briquette is not hazardous as sold. The hazards stated on this SDS refer to the powder which flakes off during transport and industrial use.

OSHA Regulatory Status

This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.122)

Label Elements

EMERGENCY OVERVIEW

Appearance	Briquette and Powder	Physical State	Solid	Odor	Odorless
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Precautionary Statements - Prevention

Do not handle until all safety precautions have been read and understood
 Airborne dust is extremely sensitive to ignition.
 Powder is a FLAMMABLE Solid.
 Keep away from heat/sparks/open flames/hot surfaces. — No smoking

Precautionary Statements - Response

Call a POISON CENTER or doctor/physician if you feel unwell
 In case of fire: Use dry sand, salt, soda ash, or Class D extinguisher for extinction

Hazards not otherwise classified (HNOC)

Airborne dust is extremely sensitive to ignition.
 Minimum ignition energy: <3mJ (ASTM E-2019).

Other Information

Other Hazards

Briquettes are mechanically pressed powder and are susceptible to flaking off as powder during typical use and storage.

Unknown acute toxicity

No information available

3. COMPOSITION/INFORMATION ON INGREDIENTS**Synonyms**

Made with titanium metal powder produced using the Armstrong Process® technology.

Chemical name	CAS No	weight-%	Trade secret
Titanium	7440-32-6	88 - 96%	
Vanadium	7440-62-2	2 - 5%	
Aluminum	7429-90-5	2 - 7%	

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4. FIRST AID MEASURES**FIRST AID MEASURES****Eye Contact**

Rinse thoroughly with plenty of water, also under the eyelids.

Skin contact

Wash skin with soap and water.

Inhalation

Not an expected route of exposure. If breathing is difficult, give oxygen.

Ingestion

Not an expected route of exposure. If swallowed, call a poison control center or physician immediately.

Most important symptoms and effects, both acute and delayed**Symptoms**

No information available.

Indication of any immediate medical attention and special treatment needed**Note to physicians**

Treat symptomatically.

5. FIRE-FIGHTING MEASURES**Suitable Extinguishing Media**

Class D extinguishing agents on fines, dust or molten metal. Dry sand. Sodium chloride powder.

Unsuitable Extinguishing Media

Do NOT use A-B-C fire extinguisher. Do not use halon type extinguisher. Do not use water, carbon dioxide or dry chemical extinguisher.

Specific hazards arising from the chemical Powder is a FLAMMABLE Solid.
Once fire begins, product is difficult to extinguish.
Minimum ignition energy: <3mJ (ASTM E-2019).

Explosion data

Sensitivity to Mechanical Impact Self-ignition may be triggered at temperatures above 450C and in the presence of oxygen.
Sensitivity to Static Discharge Fine dust dispersed in air, in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Protective equipment and precautions for firefighters As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Evacuate personnel to safe areas. Take precautionary measures against static discharges. Use personal protective equipment as required.

For emergency responders Powder is a FLAMMABLE Solid. Remove all sources of ignition. Use personal protection recommended in Section 8.

Environmental Precautions

Environmental Precautions See Section 12 for additional Ecological Information.

Methods and material for containment and cleaning up

Methods for Containment Cover with dry sand/earth.

Methods for cleaning up If powder is present
Do not vacuum!
Avoid creating dust
Take precautionary measures against static discharges
Sweep up and shovel into suitable containers for disposal
Ground and bond containers when transferring material
Use clean non-sparking tools.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling If powder is present
Keep away from heat, sparks, flame and other sources of ignition (i.e., pilot lights, electric motors and static electricity)
Take precautionary measures against static discharges
Avoid generation of dust

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep container tightly closed in a dry and well-ventilated place. Keep away from heat, sparks, flame and other sources of ignition (i.e., pilot lights, electric motors and static electricity). Incompatible with oxidizing agents. Be aware that building sprinkler systems may contribute to material hazard in the event of spilled powder fire. An H-3 occupancy rating is required for storage of flammable solids in quantities greater than 57kg based on International Building Code (IBC) and International Fire Code (IFC).

Incompatible Materials Observe acid concentration and temperature limits. Avoid hydrogen fluoride solutions.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure guidelines This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Chemical name	ACGIH TLV	OSHA PEL	NIOSH
Vanadium 7440-62-2	-	(vacated) TWA: 0.05 mg/m ³ V ₂ O ₅ respirable dust (vacated) TWA: 0.05 mg/m ³ V ₂ O ₅ fume Ceiling: 0.5 mg/m ³ V ₂ O ₅ respirable dust Ceiling: 0.1 mg/m ³ V ₂ O ₅ fume	Ceiling: 0.05 mg/m ³ V dust and fume 15 min TWA: 1 mg/m ³ STEL: 3 mg/m ³ Ferrovandium dust
Aluminum 7429-90-5	TWA: 1 mg/m ³ respirable fraction	TWA: 15 mg/m ³ total dust TWA: 5 mg/m ³ respirable fraction (vacated) TWA: 15 mg/m ³ total dust (vacated) TWA: 5 mg/m ³ respirable fraction (vacated) TWA: 5 mg/m ³ Al Aluminum	TWA: 10 mg/m ³ total dust TWA: 5 mg/m ³ respirable dust TWA: 5 mg/m ³ Al

Appropriate engineering controls

Engineering controls If powder is present, Ensure adequate ventilation, especially in confined areas

Individual protection measures, such as personal protective equipment

Eye/face Protection Wear safety glasses with side shields (or goggles).

Skin and Body Protection Wear suitable protective clothing.

Respiratory protection In case of insufficient ventilation, wear suitable respiratory equipment.

General hygiene considerations Use personal protective equipment as required. Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical State	Solid	Appearance	Briquette and Powder
Odor	Odorless	Color	Silver or black
Odor threshold	No information available		

<u>Property</u>	<u>Values</u>	<u>Remarks • Method</u>
pH		
Melting point/freezing point	1662 °C / 3034 °F	
Boiling point / boiling range	3287 °C / 5949 °F	Not applicable
Flash Point		
Evaporation Rate		
Flammability (solid, gas)		Highly flammable
Flammability Limit in Air		Not applicable
Upper flammability limit:		
Lower flammability limit:		
Vapor pressure		
Vapor Density		
Specific gravity		

Water solubility	Insoluble in water	
Solubility in other solvents		
Partition coefficient		
Autoignition Temperature	450 °C / 842 °F	powder cloud
Decomposition temperature		
Kinematic viscosity		
Dynamic viscosity		
Explosive properties	Powder is a FLAMMABLE Solid. Kst = 9 bar.m/s (5-7% AD) Kst = 92 bar.m/s (15-25% AD) AD = Apparent density Limiting Oxygen Concentration: 3.5% (+/- 1%) Minimum Ignition Energy (MIE): <3mJ (ASTM E-2019) Minimum Explosive Concentration (MEC) : 57 g/m ³	

Other Information

VOC content (%)	No information available
Bulk Density	2.3-2.9 g/cm ³

10. STABILITY AND REACTIVITY

Reactivity	None known based on information supplied
Stability	Stable under normal conditions. Will be easily ignited by heat, sparks or flames. Fire Hazard.
Possibility of hazardous reactions	At temperatures >200°C, product is incompatible with halide acids, reducing acids, oxidizing agents, and halogens
Hazardous polymerization	None under normal processing
Conditions to Avoid	Machining or cutting of briquettes. Dust formation Take precautionary measures against static discharges
Incompatible Materials	Observe acid concentration and temperature limits Avoid hydrogen fluoride solutions.
Hazardous decomposition products	None known based on information supplied

11. TOXICOLOGICAL INFORMATION**Information on likely routes of exposure**

Product Information	No data available
Inhalation	No data available.
Eye Contact	Contact with eyes may cause irritation.
Skin contact	No data available.
Ingestion	Not an expected route of exposure.

Information on toxicological effects

Symptoms	No information available.
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Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation	No information available.
Serious eye damage/eye irritation	No information available.
Sensitization	No information available.
Germ Cell Mutagenicity	No information available.
Carcinogenicity	There are no known carcinogenic chemicals in this product.
Reproductive Toxicity	No information available.
STOT - single exposure	No information available
STOT - repeated exposure	No information available.
Aspiration Hazard	No information available.

Numerical measures of toxicity

Unknown acute toxicity No information available

12. ECOLOGICAL INFORMATION

<u>Ecotoxicity</u>	None known
<u>Persistence and degradability</u>	No information available.
<u>Bioaccumulation</u>	Bioaccumulative potential.
<u>Mobility</u>	Not mobile.
<u>Other adverse effects</u>	None known based on information supplied.

13. DISPOSAL CONSIDERATIONS**Waste treatment methods**

Disposal of wastes	Disposal should be in accordance with applicable regional, national and local laws and regulations.
Contaminated packaging	Disposal should be in accordance with applicable regional, national and local laws and regulations.

Chemical name	California Hazardous Waste Status
Titanium 7440-32-6	Ignitable powder
Aluminum 7429-90-5	Ignitable powder

14. TRANSPORT INFORMATION

Note: The briquette is not hazardous as sold. The hazards stated on this SDS refer to the powder which flakes off during transport and industrial use.

DOT

Proper Shipping Name Not regulated

ICAO (air)

Proper Shipping Name Not regulated

IATA

Proper Shipping Name Not regulated

IMDG

Proper Shipping Name Not regulated

RID

Proper Shipping Name Not regulated

ADR

Proper Shipping Name Not regulated

15. REGULATORY INFORMATION

International Inventories

TSCA	Complies
DSL/NDL	Complies
EINECS/ELINCS	Complies
ENCS	Does not comply
IECSC	Complies
KECL	Complies
PICCS	Complies
AICS	Complies
NIZIC	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

ENCS - Japan Existing and New Chemical Substances

IECSC - China Inventory of Existing Chemical Substances

KECL - Korean Existing and Evaluated Chemical Substances

PICCS - Philippines Inventory of Chemicals and Chemical Substances

AICS - Australian Inventory of Chemical Substances

NIZIC - New Zealand Inventory of Chemicals

US Federal Regulations**SARA 313**

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute Health Hazard	No
Chronic Health Hazard	No
Fire Hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

US State Regulations**California Proposition 65**

This product does not contain any Proposition 65 chemicals

16. OTHER INFORMATION

Issue date	21-Apr-2011
Revision date	28-May-2015
Revision note	New format
Other Information	No information available

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of Safety Data Sheet