SAFETY DATA SHEET

Issue Date 28-May-2017 **Revision Date** 18-May-2023 **Version** 2

Section 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identifier

Catalog No. CO5079
Product Name Spherical Cobalt Alloy Powder

Synonyms CoCrMoW, Cobalt based Powder

1.2. Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Cobalt alloy product manufacture

Uses advised against

1.3. Details of the supplier of the safety data sheet

Manufacturer Address
Stanford Advanced Materials 23661 Birtcher Dr. Lake Forest, CA 92630 USA

1.4. Emergency telephone number

Emergency Telephone +1 (949) 407-8904

Section 2: HAZARDS IDENTIFICATION

This product is an article and, as such, does not present a hazard to human health by inhalation or ingestion

2.1. Classification of the substance or mixture

Regulation (EC) No 1272/2008

Acute toxicity - Oral	Category 4
Respiratory sensitisation	Category 1B
Skin sensitisation	Category 1
Carcinogenicity	Category 1B
Reproductive toxicity	Category 2
Specific target organ toxicity (repeated exposure)	Category 1
Chronic aquatic toxicity	Category 4

2.2. Label elements

Emergency Overview

Danger

Hazard statements
Harmful if swallowed
May cause allergy or asthma symptoms or breathing difficulties if inhaled.
May cause an allergic skin reaction
May cause cancer
Suspected of damaging fertility or the unborn child
Causes damage to the respiratory tract through prolonged or repeated exposure if inhaled
May cause long lasting harmful effects to aquatic life

Appearance Various massive product forms | **Physical state** Solid | **Odour** Odourless

Precautionary Statements - Prevention
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wear protective gloves

If skin irritation or rash occurs: Get medical advice/attention
If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell

Precautionary Statements - Disposal
Dispose of contents/container to an approved waste disposal plant

2.3 Hazards not otherwise classified (HNOC)
Not applicable
Other Information
When product is subjected to welding, burning, melting, sawing, brazing, grinding, buffing, polishing, or other similar heat-generating processes, the following potentially hazardous airborne particles and/or fumes may be generated: Hexavalent Chromium (Chromium VI) may cause lung, nasal, and/or sinus cancer, Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms CoCrMoW, Cobalt based Powder

Chemical Name	EC No	CAS No	Weight-%
Cobalt	213-158-0	7440-48-4	35-70
Chromium	231-157-5	7440-47-3	20-30
Nickel	231-111-4	7440-02-0	0-25
Tungsten	231-143-9	7440-33-7	0 - 15
Molybdenum	231-107-2	7439-98-7	0 - 10
Manganese	231-105-1	7439-96-5	0 - 5
Iron	231-096-4	7439-89-6	0 - 5

Section 4: FIRST AID MEASURES

4.1. Description of first aid measures

Inhalation If excessive amounts of smoke, fume, or particulate are inhaled during processing, remove to fresh air and consult a qualified health professional.

Skin Contact In the case of skin irritation or allergic reactions see a doctor.

Eye contact In the case of particles coming in contact with eyes during processing, treat as with any foreign object.

Ingestion Not an expected route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms May cause allergic skin reaction. May cause acute gastrointestinal effects if swallowed.

4.3. Indication of any immediate medical attention and special treatment needed

Note to doctors Treat symptomatically.

Section 5: FIRE FIGHTING MEASURES

5.1. Extinguishing media

Suitable extinguishing media
None in massive form, flammable as finely divided particles. Smother with salt (NaCl) or class D dry powder fire extinguisher.

Unsuitable extinguishing media
Do not spray water on burning metal as an explosion may occur. This explosive characteristic is caused by the hydrogen and steam generated by the reaction of water with the burning material

5.2. Special hazards arising from the substance or mixture

Intense heat. Very fine, high surface area material resulting from grinding, buffing, polishing, or similar processes of this product may ignite spontaneously at room temperature. WARNING: Fine particles resulting from grinding, buffing, polishing, or similar processes of this product may form combustible dust-air mixtures. Keep particles away from all ignition sources including heat, sparks, and flame. Prevent dust accumulations to minimise combustible dust hazard.

Hazardous combustion products Hexavalent Chromium (Chromium VI) may cause lung, nasal, and/or sinus cancer, Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

5.3. Advice for firefighters

Wear self-contained breathing apparatus and protective suit. Use personal protective equipment as required.

Section 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions
Use personal protective equipment as required.

For emergency responders
Use personal protective equipment as required.

6.2. Environmental precautions

Not applicable to massive product.

6.3. Methods and material for containment and cleaning up

Methods for containment Not applicable to massive product.

Methods for cleaning up Not applicable to massive product.

6.4. Reference to other sections

See Section 12: ECOLOGICAL INFORMATION.

Section 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

Advice on safe handling
Very fine, high surface area material resulting from grinding, buffing, polishing, or similar processes of this product may ignite spontaneously at room temperature. WARNING: Fine particles resulting from grinding, buffing, polishing, or similar processes of this product may form combustible dust-air mixtures. Keep particles away from all ignition sources including heat, sparks, and flame. Prevent dust accumulations to minimise combustible dust hazard.

General Hygiene Considerations
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Conditions
Keep chips, turnings, dust, and other small particles away from heat, sparks, flame and other sources of ignition (i.e., pilot lights, electric motors and static electricity).

Incompatible materials
Dissolves in hydrofluoric acid.

7.3. Specific end use(s)

Risk Management Methods (RMM)
The information required is contained in this Safety Data Sheet.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Chemical Name	European Union	United Kingdom	France	Spain	Germany
Cobalt 7440-48-4	-	STEL: 0.3 mg/m³ TWA: 0.1 mg/m³	-	TWA: 0.02 mg/m³	Skin
Chromium 7440-47-3	TWA: 2 mg/m³	STEL: 1.5 mg/m³ TWA: 0.5 mg/m³	TWA: 2 mg/m³	TWA: 2 mg/m³	TWA: 2 mg/m³
Nickel 7440-02-0	-	STEL: 1.5 mg/m³ TWA: 0.5 mg/m³	TWA: 1 mg/m³	TWA: 1 mg/m³	Skin
Tungsten 7440-33-7	-	STEL: 10 mg/m³ TWA: 5 mg/m³	-	STEL: 10 mg/m³ TWA: 5 mg/m³	-
Molybdenum 7439-98-7	-	-	-	TWA: 10 mg/m³ TWA: 3 mg/m³	-
Manganese 7439-96-5	-	STEL: 1.5 mg/m³ TWA: 0.5 mg/m³	TWA: 1 mg/m³	TWA: 0.2 mg/m³	TWA: 0.2 mg/m³ TWA: 0.02 mg/m³ Ceiling / Peak: 1.6 mg/m³ Ceiling / Peak: 0.16 mg/m³ TWA: 0.5 mg/m³
Iron 7439-89-6	-	-	-	-	-

Chemical Name	Italy	Portugal	Netherlands	Finland	Denmark
Cobalt 7440-48-4	-	TWA: 0.02 mg/m³	TWA: 0.02 mg/m³	TWA: 0.02 mg/m³	TWA: 0.01 mg/m³
Chromium 7440-47-3	TWA: 0.5 mg/m³	TWA: 0.5 mg/m³	TWA: 0.5 mg/m³	TWA: 0.5 mg/m³	TWA: 0.5 mg/m³
Nickel 7440-02-0	-	TWA: 1.5 mg/m³	-	TWA: 1 mg/m³ TWA: 0.1 mg/m³	TWA: 0.05 mg/m³
Tungsten 7440-33-7	-	STEL: 10 mg/m³ TWA: 5 mg/m³	-	TWA: 5 mg/m³	TWA: 5 mg/m³
Molybdenum 7439-98-7	-	TWA: 10 mg/m³ TWA: 3 mg/m³	-	TWA: 0.5 mg/m³	-
Manganese 7439-96-5	-	TWA: 0.2 mg/m³	-	TWA: 0.2 mg/m³ TWA: 0.1 mg/m³	TWA: 0.2 mg/m³ TWA: 0.1 mg/m³
Iron 7439-89-6	-	-	-	-	-

Chemical Name	Austria	Switzerland	Poland	Norway	Ireland

Cobalt 7440-48-4	Skin	Skin TWA: 0.05 mg/m³	STEL: 0.2 mg/m³ TWA: 0.02 mg/m³	TWA: 0.02 mg/m³ STEL: 0.06 mg/m³	TWA: 0.1 mg/m³
Chromium 7440-47-3	TWA: 2 mg/m³	TWA: 0.5 mg/m³	TWA: 0.5 mg/m³	TWA: 0.5 mg/m³ STEL: 1.5 mg/m³	TWA: 2 mg/m³
Nickel 7440-02-0	-	TWA: 0.5 mg/m³	TWA: 0.25 mg/m³	TWA: 0.05 mg/m³ STEL: 0.15 mg/m³	TWA: 0.5 mg/m³
Tungsten 7440-33-7	STEL 10 mg/m³ TWA: 5 mg/m³	TWA: 5 mg/m³	TWA: 5 mg/m³	TWA: 5 mg/m³ STEL: 10 mg/m³	TWA: 5 mg/m³ STEL: 10 mg/m³
Molybdenum 7439-98-7	STEL 20 mg/m³ TWA: 10 mg/m³	TWA: 10 mg/m³	STEL: 10 mg/m³ TWA: 4 mg/m³	-	TWA: 0.5 mg/m³
Manganese 7439-96-5	STEL 2 mg/m³ TWA: 0.5 mg/m³	TWA: 0.5 mg/m³	TWA: 0.3 mg/m³	TWA: 1 mg/m³ TWA: 0.1 mg/m³ STEL: 3 ppm STEL: 0.3 mg/m³	TWA: 0.2 mg/m³ STEL: 3 mg/m³
Iron 7439-89-6	-	-	-	-	-

Derived No Effect Level (DNEL) No DNELs are available for this product as a whole

Predicted No Effect Concentration (PNEC) No PNECs are available for this product as a whole.

8.2. Exposure controls

Engineering Controls Avoid generation of particulates.

Personal protective equipment

Eye/face protection When airborne particles may be present, appropriate eye protection is recommended. For example, tight-fitting goggles, foam-lined safety glasses or other protective equipment that shield the eyes from particles.

Skin and body protection Wear fire/flame resistant/retardant clothing. Cut-resistant gloves and/or protective clothing may be appropriate when sharp surfaces are present.

Respiratory protection When particulates/fumes/gases are generated and if exposure limits are exceeded or irritation is experienced, proper approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminate concentrations. Respiratory protection must be provided in accordance with current local regulations.

Environmental exposure controls Section 6: ACCIDENTAL RELEASE MEASURES.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Physical state	Solid		
Appearance	Various massive product forms	**Odour**	Odourless
Colour	metallic grey Silver	**Odour threshold**	Not applicable

Property	**Values**	**Remarks • Method**
pH	-	
Melting point/freezing point	1420 - 1450 °C / 2590 - 2650 °F	
Boiling point / boiling range	-	Not applicable
Flash point	-	Not applicable
Evaporation rate	-	Not applicable
Flammability (solid, gas)	-	None in massive form, flammable as finely divided particles
Flammability Limit in Air		
Upper flammability limit:		-
Lower flammability limit		-
Vapour pressure	-	Not applicable
Vapour density	-	Not applicable
Specific Gravity	7-9	
Water solubility	Insoluble	Not applicable
Solubility(ies)		Not applicable

Partition coefficient	-	Not applicable
Autoignition temperature	-	Not applicable
Decomposition temperature	-	Not applicable
Kinematic viscosity	-	Not applicable
Dynamic viscosity	-	Not applicable
Explosive properties	Not applicable	
Oxidising properties	Not applicable	

9.2. Other information

Softening point	-
Molecular weight	-
VOC Content (%)	Not applicable
Density	-
Bulk density	-

Section 10: STABILITY AND REACTIVITY

10.1. Reactivity

Not applicable .

10.2. Chemical stability

Stable under normal conditions.

Explosion data

Sensitivity to Mechanical Impact	None.
Sensitivity to Static Discharge	None.

10.3. Possibility of hazardous reactions

Hazardous polymerisation
Hazardous polymerisation does not occur.

Possibility of Hazardous Reactions
None under normal processing.

10.4. Conditions to avoid

Dust formation and dust accumulation.

10.5. Incompatible materials

Dissolves in hydrofluoric acid.

10.6. Hazardous decomposition products

When product is subjected to welding, burning, melting, sawing, brazing, grinding, buffing, polishing, or other similar heat-generating processes, the following potentially hazardous airborne particles and/or fumes may be generated: Hexavalent Chromium (Chromium VI) may cause lung, nasal, and/or sinus cancer, Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

Section 11: TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Product Information

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Inhalation	Not an expected route of exposure for product in massive form.
Eye contact	Not an expected route of exposure for product in massive form.
Skin Contact	May cause sensitisation by skin contact.
Ingestion	Not an expected route of exposure for product in massive form.

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50
Cobalt	550 mg/kg bw	>2000 mg/kg bw	<0.05 mg/L
Chromium	> 3400 mg/kg bw	-	> 5.41 mg/L
Nickel	> 9000 mg/kg bw	-	> 10.2 mg/L
Tungsten	> 2000 mg/kg bw	> 2000 mg/kg bw	> 5.4 mg/L
Molybdenum	> 2000 mg/kg bw	> 2000 mg/kg bw	> 5.10 mg/L
Manganese	>2000 mg/kg bw	-	>5.14 mg/L
Iron	98,600 mg/kg bw	-	> 0.25 mg/L

Information on toxicological effects

Symptoms May cause sensitisation by skin contact. May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause acute gastrointestinal effects if swallowed.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Acute toxicity Harmful if swallowed. Cobalt-containing powders may be fatal if inhaled.

Skin corrosion/irritation Product not classified.

Serious eye damage/eye irritation Product not classified.

Sensitisation May cause sensitisation by skin contact. Cobalt-containing alloys may cause sensitization by inhalation.

Germ cell mutagenicity Product not classified.

Carcinogenicity May cause cancer by inhalation.

Chemical Name	ACGIH	IARC	NTP	OSHA
Cobalt 7440-48-4	A3	Group 2A Group 2B	Known	X
Chromium 7440-47-3		Group 3		
Nickel 7440-02-0		Group 1 Group 2B	Known Reasonably Anticipated	X

Reproductive toxicity Possible risk of impaired fertility.

STOT - single exposure Product not classified.

STOT - repeated exposure Causes disorder and damage to the: Respiratory System.

Aspiration hazard Product not classified.

Section 12: ECOLOGICAL INFORMATION

12.1. Toxicity

This product as shipped is classified for aquatic chronic toxicity

Chemical Name	Algae/aquatic plants	Fish	Toxicity to Micro-organisms	Crustacea
Cobalt	The 72 h EC50 of cobalt dichloride to Pseudokirchneriella subcapitata was 144 ug of Co/L.	The 96h LC50 of cobalt dichloride ranged from 1.5 mg Co/L for Oncorhynchus mykiss to 85 mg Co/L for Danio rerio.	The 3 h EC50 of cobalt dichloride for activated sludge was 120 mg of Co/L.	The 48 h LC50 of cobalt dichloride ranged from 0.61 mg Co/L for Ceriodaphnia dubia tested in soft, DOM-free water to >1800mg Co/L for Tubifex tubifex in very hard water.
Chromium	-	-	-	-
Nickel	NOEC/EC10 values range from 12.3 µg/l for	The 96h LC50s values range from 0.4 mg Ni/L for	The 30 min EC50 of nickel for activated sludge was	The 48h LC50s values range from 0.013 mg Ni/L

	Scenedesmus accuminatus to 425 µg/l for Pseudokirchneriella subcapitata.	Pimephales promelas to 320 mg Ni/L for Brachydanio rerio.	33 mg Ni/L.	for Ceriodaphnia dubia to 4970 mg Ni/L for Daphnia magna.
Tungsten	The 72 h EC50 of sodium tungstate to Pseudokirchnerella subcapitata was 31.0 mg of W/L.	The 96 h LC50 of sodium tungstate to Danio rerio was greater than 106 mg of W/L.	The 30 min EC50 of sodium tungstate for activated sludge were greater than 1000 mg/L.	The 48 h EC50 of sodium tungstate to Daphnia magna was greater than 96 mg of W/L.
Molybdenum	The 72 h EC50 of sodium molybdate dihydrate to Pseudokirchneriella subcapitata was 362.9 mg of Mo/L.	The 96 h LC50 of sodium molybdate dihydrate to Pimephales promelas was 644.2 mg/L	The 3 h EC50 of molybdenum trioxide for activated sludge was 820 mg/L.	The 48 h LC50 of sodium molybdate dihydrate to Ceriodaphnia dubia was 1,015 mg/L. The 48 h LC50 of sodium molybdate dihydrate to Daphnia magna was greater than 1,727.8 mg/L.
Manganese	The 72 h EC50 of manganese to Desmodesmus subspicatus was 2.8 mg of Mn/L.	The 96 h LC50 of manganese to Oncorhynchus mykiss was greater than 3.6 mg of Mn/L	The 3 h EC50 of manganese for activated sludge was greater than 1000 mg/L.	The 48 h EC50 of manganese to Daphnia magna was greater than 1.6 mg/L.
Iron	-	The 96 h LC50 of 50% iron oxide black in water to Danio rerio was greater than 10,000 mg/L.	The 3 h EC50 of iron oxide for activated sludge was greater than 10,000 mg/L.	The 48 h EC50 of iron oxide to Daphnia magna was greater than 100 mg/L.

12.2. Persistence and degradability

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12.3. Bioaccumulative potential

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12.4. Mobility in soil

12.5. Results of PBT and vPvB assessment

The PBT and vPvB criteria do not apply to inorganic substances.

12.6. Other adverse effects

This product as shipped is not classified for acute environmental endpoints. However, when subjected to sawing or grinding, particles may be generated that are classified for aquatic acute toxicity

Section 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste from residues/unused products Disposal should be in accordance with applicable regional, national and local laws and regulations.

Contaminated packaging None anticipated.

Section 14: TRANSPORT INFORMATION

IMDG

14.1 UN/ID no Not regulated
14.2 Proper shipping name Not regulated
14.3 Hazard Class Not regulated
14.4 Packing Group Not regulated
14.5 Marine pollutant Not applicable
14.6 Special Provisions None

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable

RID

14.1 UN/ID no	Not regulated
14.2 Proper shipping name	Not regulated
14.3 Hazard Class	Not regulated
14.4 Packing Group	Not regulated
14.5 Environmental hazard	Not applicable
14.6 Special Provisions	None

ADR

14.1 UN/ID no	Not regulated
14.2 Proper shipping name	Not regulated
14.3 Hazard Class	Not regulated
14.4 Packing Group	Not regulated
14.5 Environmental hazard	Not applicable
14.6 Special Provisions	None

ICAO (air)

14.1 UN/ID no	Not regulated
14.2 Proper shipping name	Not regulated
14.3 Hazard Class	Not regulated
14.4 Packing Group	Not applicable
14.5 Environmental hazard	Not applicable
14.6 Special Provisions	None

IATA

14.1 UN/ID no	Not regulated
14.2 Proper shipping name	Not regulated
14.3 Hazard Class	Not regulated
14.4 Packing Group	Not regulated
Description	Not applicable
14.5 Environmental hazard	Not applicable
14.6 Special Provisions	None

Section 15: REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

Chemical Name	French RG number	Title
Cobalt 7440-48-4	RG 65,RG 70,RG 70bis,RG 70ter	-
Chromium 7440-47-3	RG 10	-
Nickel 7440-02-0	RG 37ter	-
Tungsten 7440-33-7	-	-
Molybdenum 7439-98-7	-	-
Manganese 7439-96-5	-	-
Iron 7439-89-6	RG 44,RG 44bis,RG 94	-

European Union

Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work

Authorisations and/or restrictions on use:
This product does not contain substances subject to authorisation (Regulation (EC) No. 1907/2006 (REACH), Annex XIV). This product does not contain substances subject to restriction (Regulation (EC) No. 1907/2006 (REACH), Annex XVII).

International Inventories

DSL/NDSL	Complies
EINECS/ELINCS	Complies
ENCS	Complies
IECSC	Complies
KECL	Complies
PICCS	Complies
AICS	Complies

Legend:
TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - 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

15.2. Chemical safety assessment

No chemical safety assessment has been performed for this product.

Section 16: OTHER INFORMATION

Issue Date	28-May-2017
Revision Date	18-May-2023
Revision Note	Updated Section(s): 2.

This material safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006

Note:
The information provided in this Material 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

Additional information available from: Safety data sheets and labels available at SAM