SAFETY DATA SHEET

Version: 1.0 Date: 20th May 2021

ACCORDING TO EC-REGULATIONS 1907/2006 (REACH), 1272/2008 (CLP) & 2015/830

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

1.1 Product identifier

Product name	17-4PH Metal Powder

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

Identified Use(s)	Additive manufacturing, hot isostatic pressing, thermal spray, metal injection moulding, binder jetting.
Uses advised against	Any other use.

1.3 Details of the supplier of the safety data sheet

Company Identification	Liberty Powder Metals Ltd. Materials Processing Institute, Eston Road, Middlesbrough, TS6 6US
Telephone	+44(0)164 238 200
E-mail (competent person)	powders@libertysteelgroup.com

1.4 Emergency telephone number

Emergency Phone No.	999 / 911 or local emergency number
Languages spoken	Local language 24/7

SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

2.1.1 Regulation (EC) No. 1272/2008 (CLP)

Skin Sens. 1; H317
Carc. 2; H351
STOT RE 1; H372
Aquatic Chronic 3; H412

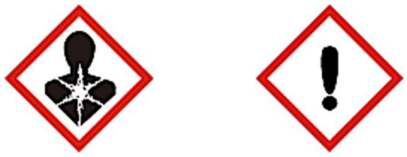
2.2 Label elements

According to Regulation (EC) No. 1272/2008 (CLP)

Product name: 17-4PH Metal Powder

Contains: Nickel

Hazard Pictogram(s)



Signal Word(s): DANGER

Hazard Statement(s):
H317: May cause an allergic skin reaction.
H351: Suspected of causing cancer.
H372: Causes damage to organs through prolonged or repeated exposure.
H412: Harmful to aquatic life with long lasting effects.

Precautionary Statement(s):
P201: Obtain special instructions before use.
P260: Do not breathe dust.
P280: Wear protective gloves/protective clothing/eye protection/face protection/hearing protection.
P302+P352: IF ON SKIN: Wash with plenty of water.
P308+P313: IF exposed or concerned: Get medical advice/attention.
P273: Avoid release to the environment.

Supplemental information: Not applicable

2.3 Other hazards

Handling of this material may generate a dust which can cause mechanical irritation of the eyes, skin nose and throat.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

EC Classification Regulation (EC) No. 1272/2008 (CLP)

Chemical identity of the substance	%W/W	CAS No.	EC No.	REACH Registration No.	Hazard classification
Nickel	< 6	7440-02-0	231-111-4	Not yet assigned in the supply chain	Skin Sens. 1; H317 Carc. 2; H351 STOT RE 1; H372 Aquatic Chronic 3; H412
Copper	< 6	7440-50-8	231-159-6	Not yet assigned in the supply chain	Aquatic Chronic 2; H411
Manganese	< 2	7439-96-5	231-105-1	Not yet assigned in the supply chain	Aquatic Chronic 2; H411

For full text of H phrases see section 16.

SECTION 4: FIRST AID MEASURES

4.1 Description of first aid measures

Self-protection of the first aider: Obtain special instructions before use. No action should be taken involving personal risk. Use personal protective equipment as required. Wear appropriate personal protective equipment, avoid direct contact. Ensure adequate ventilation. Do not breathe dust. Avoid contact with skin and eyes.

Inhalation: IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention immediately.

Skin contact: IF ON SKIN: Gently wash with plenty of soap and water. If skin irritation or rash occurs: Get medical advice/attention. Remove contaminated clothing and wash clothing before reuse.

Eye contact: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation develops and persists, get medical attention.

Ingestion: IF SWALLOWED: Rinse mouth. Give plenty of water to drink. Do NOT induce vomiting. Seek medical treatment.

4.2 Most important symptoms and effects, both acute and delayed

May cause an allergic skin reaction. Suspected of causing cancer. Causes damage to organs through prolonged or repeated exposure.

4.3 Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media: As appropriate for surrounding fire. Use CO_2, dry chemical, or foam.

Unsuitable extinguishing media: Do not use water jet. Direct water jet may spread the fire.

5.2 Special hazards arising from the substance or mixture

Not flammable. Combustion products:, Carbon monoxide, Carbon dioxide and Nickel carbonyl gas.

5.3 Advice for firefighters

Fight fire with normal precautions from a reasonable distance. Fire fighters should wear complete protective clothing including self-contained breathing apparatus.

Keep containers cool by spraying with water if exposed to fire. Avoid run off to waterways and sewers.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Caution - spillages may be slippery. Ensure operatives are trained to minimise exposures. No action should be taken involving personal risk. Wear appropriate personal protective equipment, avoid direct contact. Do not breathe dust. Ensure adequate ventilation. Remove contaminated clothing and wash all affected areas with plenty of water. Avoid dust generation.

6.2 Environmental precautions

Avoid release to the environment. Do not allow to enter drains, sewers or water courses.

6.3 Methods and material for containment and cleaning up

Provided it is safe to do so, isolate the source of the leak. Sweep spilled substances into containers if appropriate moisten first to prevent dusting. Use non-sparking equipment when picking up flammable spill. Collect mechanically and dispose of according to Section 13. Use non-sparking tools. Ventilate the area and wash spill site after material pick-up is complete.

6.4 Reference to other sections

See Section: 8,13.

SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling

When using do not eat or drink. Provide adequate ventilation when using the material and follow the principles of good occupational hygiene to control personal exposures. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Do not eat, drink or smoke when using this product. Remove contaminated clothing and wash clothing before reuse.

7.2 Conditions for safe storage, including any incompatibilities

Keep only in original packaging. Keep in a well ventilated place. Keep container closed.

Storage temperature

Store in a cool/low-temperature, well-ventilated (dry) place away from heat and ignition sources.

Incompatible materials

Keep away from acids and strong oxidising agents.

7.3 Specific end use(s)

See Section: 1.2.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

8.1.1 Occupational exposure limits

The UK HSE (EH40) recommends the following limits for dusts: 10 mg/m^3 (8hr TWA) total inhalable dust; 4 mg/m^3 (8hr TWA) total respirable dust.

SUBSTANCE	CAS No.	LTEL (8 hr TWA ppm)	LTEL (8 hr TWA mg/m³)	STEL (ppm)	STEL (mg/m³)	Note
Nickel	7440-02-0	-	0.5	-	-	UK WEL
Copper and compounds; dust and mists	-	0.2	-	-	-	UK WEL
Manganese	7439-96-5	- -	0.2 0.05	- -	- -	UK WEL Inhalable fraction Respirable fraction
Silicon	7440-21-3	 -	10 4	10 4	10 4	UK WEL Inhalable fraction Respirable fraction

Source: UK WEL: Workplace Exposure Limit (UK HSE EH40)

8.1.2 Biological limit value

Not established.

8.1.3 PNECs and DNELs

Not established.

8.2 Exposure controls

8.2.1	**Appropriate engineering controls**	Provide adequate ventilation, including appropriate local extraction if dusts, fumes or vapours are likely to be evolved. Do not breathe dust. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment).
8.2.2	**Individual protection measures, such as personal protective equipment**	Obtain special instructions before use. Keep good industrial hygiene. Wear appropriate personal protective equipment, avoid direct contact. Avoid contact with skin, eyes or clothing. Do not eat, drink or smoke at the work place. Do not breathe dust.

Protective clothing should be selected specifically for the working place, depending on concentration and quantity of the hazardous substances handled. The resistance of the protective clothing to chemicals should be ascertained with the respective supplier.

Eye/ face protection 	Wear eye protection with side protection (EN166). Eyewash bottles should be available.
Skin protection 	**Hand protection:** Wear impervious gloves (EN374). Gloves should be changed regularly to avoid permeation problems. Breakthrough time of the glove material: refer to the information provided by the gloves' producer. Protective index 6, corresponding > 480 minutes of permeation time according to EN 374. **Body protection:** Wear dust-resistant protective clothing.
Respiratory protection 	Not normally required. Wear suitable respiratory protective equipment if processing involves working in areas where dusts or vapours are likely to be evolved. In case of inadequate ventilation wear respiratory protection. Recommended: EN143 Type A-P2.
Thermal hazards	Not applicable.

8.2.3	**Environmental exposure controls**	Avoid release to the environment.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Fine grey powder.
Odour	Odourless.
Odour threshold	Not applicable.
pH	No information available.
Melting point/freezing point	1404 - 1440°C
Initial boiling point and boiling range	No information available.
Flash point	No information available.
Evaporation rate	No information available.
Flammability (solid, gas)	Not flammable.
Upper/lower flammability or explosive limits	Does not support combustion. (BS EN 14034) Layer ignition temperature - >400°C (BS EN 50281-2-1)
Vapour pressure	No information available.
Vapour density	No information available.
Relative density	7.8 g/cm^3
Solubility(ies)	No information available.
Partition coefficient: n-octanol/water	No information available.
Auto-ignition temperature	No information available.
Decomposition temperature	No information available.
Viscosity	No information available.
Explosive properties	Not explosive
Oxidising properties	Not oxidising.

9.2 Other information

Particle size	>0 µm
Loss on Drying	No information available.
Moisture Content	0.0 % w/w

SECTION 10: STABILITY AND REACTIVITY

10.1	**Reactivity**	Stable under normal conditions.
10.2	**Chemical stability**	Stable under normal conditions.
10.3	**Possibility of hazardous reactions**	Hazardous polymerisation will not occur.
10.4	**Conditions to avoid**	Hydrogen gas can be liberated when nickel or its alloys react with acids. In reduced atmospheres nickel can react with carbon monoxide to form Ni(CO)4, which is an extremely toxic gas.
10.5	**Incompatible materials**	Keep away from: acids and strong oxidising agents.
10.6	**Hazardous decomposition products**	Combustion products:, Carbon monoxide, Carbon dioxide and Nickel carbonyl gas.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute Toxicity - Ingestion		Mixture: Based upon the available data, the classification criteria are not met. Calculated acute toxicity estimate (ATE) >2,000 mg/kg.
Acute Toxicity - Inhalation		Mixture: Based upon the available data, the classification criteria are not met. Calculated acute toxicity estimate (ATE) > 5 mg/L (Dust)
Acute Toxicity - Skin contact		Mixture: Based upon the available data, the classification criteria are not met. Calculated acute toxicity estimate (ATE) >2,000 mg/kg.
Skin corrosion/irritation		Mixture: Based upon the available data, the classification criteria are not met.
Serious eye damage/irritation		Mixture: Based upon the available data, the classification criteria are not met.
Respiratory or skin sensitisation		Mixture: Skin Sens. 1; H317: May cause an allergic skin reaction.
	Nickel	Skin Sens. 1; H317: May cause an allergic skin reaction. EU Harmonised Classification EU ECHA Registration Endpoint summary Skin sensitization - Adverse effects observed (NiPERA Report, 2010)
Germ cell mutagenicity		Mixture: Based upon the available data, the classification criteria are not met.
Carcinogenicity		Mixture: Carc. 2; H351: Suspected of causing cancer.
	Nickel	Carc. 2; H351: Suspected of causing cancer. EU Harmonised Classification EU ECHA Registration Endpoint summary
Reproductive toxicity		Mixture: Based upon the available data, the classification criteria are not met.
STOT - single exposure		Mixture: Based upon the available data, the classification criteria are not met.
STOT - repeated exposure		Mixture: STOT RE 1; H372: Causes damage to organs through prolonged or repeated exposure.
	Nickel	STOT RE 1; H372: Causes damage to organs through prolonged or repeated exposure. EU Harmonised Classification Oral: NOAEL – 2.2 mg/kg/bw day (rat) (Unnamed publication, 2007) Inhalation: LOAEC – 0.1mg/m³ (rat) (OECD 451) Dermal: No data
Aspiration hazard		Mixture: Based upon the available data, the classification criteria are not met.

11.2 Other information None known

SECTION 12: ECOLOGICAL INFORMATION

12.1	**Toxicity**	Mixture: Aquatic Chronic 3; H412: Harmful to aquatic life with long lasting effects. Estimated LC50 (Mixture): >10 - ≤ 100 mg/l
	Nickel	Aquatic Chronic 3; H412: Harmful to aquatic life with long lasting effects. EU Harmonised Classification

			NOEC: 0.057 ug/L (Birge et al. 1984)
		Copper	Aquatic Chronic 2; H411: Toxic to aquatic life with long lasting effects. EU Harmonised Classification
		Manganese	Aquatic Chronic 2; H411: Toxic to aquatic life with long lasting effects. LC50: 0.17-15.61 mg/l (28 days) (U. S. National Library of Medicine, 2018)
12.2	**Persistence and degradability**		No data for the mixture as a whole.
		Nickel	Not applicable for inorganic substances.
		Copper	Not applicable for inorganic substances.
		Manganese	Not applicable for inorganic substances.
12.3	**Bioaccumulative potential**		No data for the mixture as a whole.
		Nickel	Low bioaccumulation potential. BCF: 45 (Alikhan et al. 1989)
		Copper	Testing can be waived because the substance is an inorganic compound
		Manganese	Low bioaccumulation potential. BCF: 19 (SOREN NORDAHL HANSEN, et.al. 1995)
12.4	**Mobility in soil**		No data for the mixture as a whole.
		Nickel	The product is predicted to have high mobility in soil. Log Kp: 4.51 (Elbaz-Poulichet et al. 1996)
		Manganese	The product is predicted to have low mobility in soil. Kd: ~994 (OECD 106)
12.5	**Results of PBT and vPvB assessment**		Not classified as PBT or vPvB.
12.6	**Other adverse effects**		None known.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1	**Waste treatment methods**	Do not allow to enter drains, sewers or watercourses. Dispose of this material and its container as hazardous waste. Disposal should be in accordance with local, state or national legislation.
13.2	**Additional information**	Avoid release to the environment.

SECTION 14: TRANSPORT INFORMATION

		ADR/RID	**IMDG**	**IATA/ICAO**
14.1	**UN number**	None assigned.	None assigned.	None assigned.
14.2	**UN proper shipping name**	None assigned.	None assigned.	None assigned.
14.3	**Transport hazard class(es)**	None assigned.	None assigned.	None assigned.
14.4	**Packing group**	None assigned.	None assigned.	None assigned.
14.5	**Environmental hazards**	Not classified	Not classified as a Marine Pollutant.	Not classified
14.6	**Special precautions for user**	See Section: 2		
14.7	**Transport in bulk according to Annex II of Marpol and the IBC Code**	No information available.	No information available.	No information available.

SECTION 15: REGULATORY INFORMATION

15.1	**Safety, health and environmental regulations/legislation specific for the substance or mixture**		
15.1.1	**EU regulations**		
		Authorisations and/or restrictions on use	Not restricted
15.1.2	**National regulations**		
		Germany	Water hazard class: 2
15.2	**Chemical Safety Assessment**		A REACH chemical safety assessment has not been carried out. Exposure scenarios for substances in this preparation are not available.

SECTION 16: OTHER INFORMATION

The following sections contain revisions or new statements: Not applicable – V1.0

References:

EU Harmonised Classification and EU ECHA registration dossier for Nickel (CAS No. 7440-02-0) and Copper (CAS No. 7440-50-8).
ECHA registration dossier for Manganese (CAS No. 7439-96-5).
Test Result, Report Number: R001913R2V1GR, Sigma-HSE (UK) Ltd (2021).

Literature references

1. Birge, W.J., J.A. Black, J.F. Hobson, A.G. Westerman, and T.M. Short. 1984. Water Resources Research Institute. Kentucky University, Lexington, KY. Research Report No. 151.
2. U. S. National Library of Medicine. 2018. To determine long- term toxicity of test chemical on Oncorhynchus mykiss. HSDB (Hazardous Substances Data Bank); US national Library of Medicine reviewed by SRC.
3. Alikhan, M.A., Zia, S. 1989. Nickel uptake and regulation in a copper-tolerant Decapod, Cambarus (Fabricius) (Decapoda, Crustacea). Bull. Environ. Contam. Toxicol: 42, 94-102.
4. SOREN NORDAHL HANSEN, et.al. 1995. Marine Pollution Bulletin, 1995.
5. Elbaz-Poulichet, F., Garnier, J.M., Guan, D.M., Martin, J.M., Thomas, A.J. 1996. The conservative behaviour of Trace metals (Cd, Cu, Ni, Pb) and As in the surface plume of stratified estuaries: example of the Rhome River (France). Estuarine, Coastal and Shelf Science: 42, 289-310.

EU Classification: This Safety Data Sheet was prepared in accordance with EC Regulation (EC) 1907/2006 (REACH), 1272/2008 (CLP) & 2015/830.

Classification of the substance or mixture According to Regulation (EC) No. 1272/2008 (CLP)	**Classification procedure**
Skin Sens. 1; H317	Threshold Calculation
Carc. 2; H351	Threshold Calculation
STOT RE 1; H372	Threshold Calculation
Aquatic Chronic 3; H412	Summation Calculation

LEGEND

ADR	ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road
BCF	Bioconcentration factor
CAS	Chemical Abstracts Service
DNEL	Derived No Effect Level
EC	European Community
EN	European Standard
EU	European Union
IATA	International Air Transport Association
ICAO/IATA	ICAO: International Civil Aviation Organization / IATA: International Air Transport Association
IMDG	International Maritime Dangerous Goods
LC50	Lethal concentration 50
LD50	Lethal dose 50
LIT	Layer Ignition Temperature
LOAEC	Lowest observed adverse effect concentration
LTEL	Long Term Exposure Limit
MIE	Minimum Ignition Energy
MIT	Minimum Ignition Temperature
NOEC	No Observed Effect Concentration
NOAEL	No Observed Adverse Effect Level
OECD	Organisation for Economic Cooperation and Development
PBT	Persistent, Bioaccumulative and Toxic
PNEC	Predicted No Effect Concentration
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
UN	United Nations
vPvB	Very Persistent and very Bioaccumulative
WGK	Wassergefährdungsklasse (Germany) / Water hazard class

Hazard classification / Classification code:
Skin Sens. 1; Skin Sensitisation, Category 1
Carc. 2; Carcinogenicity, Category 2

Hazard Statement(s)
H317: May cause an allergic skin reaction.
H351: Suspected of causing cancer.

STOT RE 1; Specific target organ toxicity — repeated exposure, Category 1	H372: Causes damage to organs through prolonged or repeated exposure.
Aquatic Chronic 2; Hazardous to the aquatic environment, Chronic , Category 2	H411: Toxic to aquatic life with long lasting effects.
Aquatic Chronic 3; Hazardous to the aquatic environment, Chronic , Category 3	H412: Harmful to aquatic life with long lasting effects.

Training advice: Consideration should be given to the work procedures involved and the potential extent of exposure as they may determine whether a higher level of protection is required.

Disclaimers

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Annex to the extended Safety Data Sheet (eSDS)

Exposure Scenarios are not applicable