Copper Concentrate

Section 1. Identification of the Substance and Company

1.1 Product Identification:
Product Name: Copper Concentrate
Synonyms: OD Copper Concentrate, Sudbury Copper Concentrate, Clarabelle Mill Cu Concentrate, Cu Concentrate

EC No: Not available
CAS No: Not available

1.2 Uses
Identified uses:
Intermediate product used for the recovery of metal values.

1.3 Company Identification:

Manufactured by:
Vale Canada Limited
Clarabelle Mill
Sudbury ON, Canada

Distributed by:
Vale Canada Limited
200 Bay St., Royal Bank Plaza
Suite 1500, South Tower, PO Box 70
Toronto, Ontario, Canada, M5J 2K2
Email: msds@vale.com

REACH Only Representative for Vale Canada
H2 Compliance
Rubicon Building, CIT Campus
T12Y275, Bishopstown
Cork, Republic of Ireland
Chris Terrett, OR Manager
Tel: +353-21-486-8121
Email: Chris.Terrett@h2compliance.com

Imported into the EU by:
Vale Holdings BV, Piet Heinkade 55, 1019GM,
Amsterdam, The Netherlands
Tel No 31 20 308 5644 214

For Fire, Spill, or chemical emergency call CHEMTREC: +1 703-527-3887
For Europe Call CHEMTREC: + 44 870 8200418

On Vale property, please follow your appropriate spill procedures

Section 2. Hazards Identification

2.1 Classification of the Substance:
Specific Target Organ Toxicity, Repeated exposure – Category 2
Aquatic acute – Category 2

Hazard Pictograms: GHS08 – Health Hazard

Signal Word: Warning

Hazard Statements: H373: May cause damage to organs through prolonged or repeated exposure

H401: Toxic to aquatic life

Precautionary Statements: P260, P273, P314, P501

2.2 Label elements

Product identifier: Copper Concentrate
EC No: Not available
CAS No: Not available
Symbols:

GHS08 – Health Hazard

Signal Word: Warning

Hazard Statements: H373: May cause damage to organs through prolonged or repeated exposure
H401: Toxic to aquatic life

Precautionary Statements: P260: Do not breathe dust/ fume/gas/mist/ vapours/spray
P273: Avoid release to the environment.
P314: Get medical advice/attention if you feel unwell
P501: Dispose of contents/container in accordance to local/regional/national/international regulations

Section 3. Composition

☐ **Substance)** ☒ **Mixture (MCS)**

Typical Analysis: %

Hazardous Ingredients	Typical Composition (%)	C.A.S. Number
Chalcopyrite, $CuFeS_2$	75-100	1308-56-1
Pentlandite $(Ni, Fe)_9S_8$	7-13	53809-86-2
Pyrrhotite Fe_{n-1} Sn	5-10	1310-50-5
Crystalline Silica	1-3	14808-60-7

Section 4. First Aid Measures

Ingestion:	Get immediate medical attention
Inhalation:	For respiratory tract irritation, remove to fresh air. If symptoms persist, seek medical care.
Skin:	For skin irritation, flush with plenty of water. For skin rashes, seek medical attention.
Eyes:	Irrigate eyeball thoroughly with water for at least 10 minutes. If discomfort persists seek medical attention.
Most important symptoms and affects, both acute and delayed	Skin contact: Rash Eye contact: Redness
Indication of immediate medical attention and special treatment needed	No special requirements

Section 5. Fire Fighting Measures

Suitable extinguishing media:	Any, type to be selected according to materials stored in the immediate neighbourhood.
Special risks:	Non-flammable. May evolve toxic sulphur containing gases if involved in a fire. Extinguish surrounding fires with appropriate methods.
Special protective equipment for fire fighting:	None needed. Wear protective equipment if required for other materials within the immediate vicinity.

Section 6. Accidental Release Measures

Person related precautionary measure	Wear waterproof gloves and suitable protective clothing. Avoid generation of dus atmospheres. Do not inhale dusts. Wear appropriate nationally approved respirators if collection and disposal of spills is likely to cause the concentration limits of airborne nickel to exceed the locally prescribed exposure limits.
Environmental Protecti measures:	Do not allow spills to enter watercourses. Dispose of spills in accordance with loca regulations.
Procedures for cleaning/absorption:	Collect spills by sweeping or vacuuming with the vacuum exhaust passing through high efficiency particulate arresting (HEPA) filter if exhaust is discharged into the work place. Copper-containing material is normally collected to recover copper values.

Section 7. Handling and Storage

Precautions for Safe Handling: Prevent the generation of inhalable dusts e.g. by the use of suitable ventilation. Do not inhale dust. Keep in a moist condition and if possible avoid drying and minimize dust generation. Wear appropriate protective clothing including waterproof gloves and nationally approved respirators. Contaminated work clothing should not be allowed out of the workplace.

Conditions for Safe Storage: Keep in the container supplied, and keep container closed when not in use. Local regulations should be followed regarding the storage of this product.

Section 8. Exposure Controls / Personal Protection

8.1.1 Exposure Limits:

	ACGIH TLV-TWA[1]
Chalcopyrite, CuFeS2	1 mg/m3 as Cu
Pentlandite (Ni, Fe)gS_8	0.2mg/m3 as Ni*
Pyrrhotite Fe_{n-1} Sn	Not available
Crystalline Silica	0.025**

*-as inhalation fraction
** - as respirable fraction

DNEL's

	Unit	DNEL
Inhalation		
Acute local	mgCu/m^3	1.0
Long-term local	mgCu/m^3	1.0

8.1.2 Environmental limits:

PNEC's

Compartment	Unit	PNEC
Freshwater	µg Cu/L	7.8
Marine	µg Cu/L	5.2

8.2.1 Occupational exposure controls:

Do not inhale dust. Mechanical extraction ventilation may be required if user operations change it to other physical or chemical forms, whether as end products, intermediates or fugitive emissions, which are inhalable. Maintain airborne nickel levels as low as possible. Avoid repeated skin contact.

PPE

Respiratory protection: If required, use an approved respirator with particulate filters.

Eye protection: Avoid eye contact. Wear goggles or face shield.

Hand & Skin Protection: Avoid skin contact. Wear suitable protective clothing and waterproof gloves. Wash skin thoroughly after handling and before eating, drinking or smoking. Launder clothing and gloves as needed. Use of skin-protective barrier cream advised.

Section 9. Physical and Chemical Properties

Odourless, greyish-green, moist powder.

Physical state at 20°C and 101.3 kPa	solid
Melting/freezing point	Not available
Boiling point	Not available
Decomposition temperature	Not available
Relative density	Not available
Vapour pressure	Not applicable
Vapour density	Not applicable
Surface tension	Not applicable
Water solubility	Insoluble
pH	Not applicable
Evaporation rate	Not applicable
Partition coefficient n-octanol/water (log value)	Not applicable
Flash point	Not applicable
Flammability	Non-flammable
Explosive properties	Not applicable
Self-ignition temperature	Not available
Oxidising properties	Non-oxidising
Stability in organic solvents and identity of relevant degradation products	Not applicable
Dissociation constant	Not applicable
Viscosity	Not applicable

Section 10. Stability and Reactivity

Reactivity Stable under normal conditions.

Chemical stability Stable under normal conditions.

Possibility of hazardous reactions	Stable under normal conditions.
Conditions to avoid	Heat, ignition sources
Incompatible materials	Many sulphides react violently and explosively with powerful oxidizers, evolving SO_2
Hazardous Decomposition Product(s)	At high temperatures toxic sulphur containing gases may be evolved.

Section 11. Toxicological Information[2]

As a mixture the toxicological properties of this product are unknown. The toxicology of the reported ingredients are summarized below.

Chalcopyrite:
Significant information specific to chalcopyrite was not found in the literature information supplied based on copper.

Pre-existing conditions:	Wilson's disease can occur in certain individuals with a rare inherited metabolic disorder characterized by retention of excessive amounts of copper in the liver, brain, kidneys and corneas. These deposits eventually lead to tissue necrosis and fibrosis, causing a variety of clinical effects, especially liver (i.e. hepatic) disease and neurologic changes. Wilson's disease is progressive and, if left untreated, leads to fatal liver (i.e. hepatic) failure.

Pyrrhotite:
An extensive literature search revealed no toxicological or health hazard information specific to this material

Pentlandite:
Acute Toxicity:

a) Oral:	Not available
b) Inhalation:	Not available
c) Dermal:	Not available

Corrosivity/Irritation:

a) Respiratory Tract:	No classification
b) Skin:	No classification
c) Eyes:	No classification

Sensitization:

a) Respiratory tract:	No information available
b) Skin:	Nickel metal is a well-known skin sensitizer. Direct and prolonged skin contact with metallic nickel may induce nickel allergy and elicit nickel allergic

skin reactions in those people already sensitized to nickel, so called nickel allergic contact dermatitis.

c) Pre-existing conditions:

Individuals known to be allergic to nickel should avoid contact with nickel whenever possible to reduce the likelihood of nickel allergic contact dermatitis reactions (skin rashes). Repeated contact may result in persistent chronic palmar/hand dermatitis in a smaller number of individuals, despite efforts to reduce or avoid nickel exposure.

Chronic toxicity:

a) Oral: No information available

b) Inhalation: The International Agency for Research on Cancer (IARC) concluded there was insufficient evidence that nickel compounds are carcinogenic to humans. Intratracheal instillation of pentlandite (>98% pure) in hamsters did not produce a significant increase in lung tumours. The pentlandite remained in the lung nine times longer than the positive control Ni_3S_2), which also did not produce a significant increase in lung tumours.

c) Dermal: No information available.

Silica

ACUTE EFFECTS:

Inhalation: High concentrations of dust may cause coughing and mild, temporary irritation following a short-term exposure. Quartz can have potentially serious respiratory effects following long- term inhalation.

Skin Contact: Quartz dust is not expected to be irritating to the skin.

Eye Contact: Silica dust is not expected to be irritating to the eyes except as a "foreign object". Some tearing, blinking and mild temporary pain may occur as the solid material is rinsed from the eye by tears.

Ingestion: Quartz is most likely not toxic following short-term ingestion. No human or animal information is available.

CHRONIC EFFECTS:

Lungs/Respiratory System: Prolonged or repeated exposure to fine airborne crystalline silica dust may cause severe scarring of the lungs, a disease called silicosis. The risk of developing and the severity of silicosis depends on the airborne concentration of aerodynamic respirable-size silica dust to which an employee is exposed, and duration of exposure. Silicosis usually develops gradually over 20 years or more of exposure. Early symptoms of silicosis (cough, mucous production and shortness of breath upon exertion) may be seen with other conditions, so the development of silicosis may not be detected until advanced stages of the disease. Silicosis may continue to develop even after exposure to crystalline silica has stopped. Evidence of silicosis can normally be seen on an X- ray.

Silicosis can vary in severity from minimal to severe. In cases of mild silicosis, there is typically no significant respiratory impairment, although there is X-ray evidence of lung injury. In severe cases, significant and increasingly severe respiratory impairment develops.

There is no proven effective treatment for the disease. Life expectancy may be reduced, depending on the severity of the case. Death is not usually a direct result of silicosis, but cardiac failure may occur as the heart has increasing difficulty pumping blood through the scar tissue in the lungs. Silicosis may be complicated by the development of bacterial infections, including tuberculosis. "Accelerated" silicosis can results from exposure to high concentrations of crystalline silica over a period of 5 to 10 years.

Quartz dust can accumulate in the lungs. Inhaled particles are deposited at various locations within the respiratory tract, depending on their shape, mass, aerodynamic characteristics and other physical properties. Most, but not all, silica is cleared from the lungs after inhalation and deposition. The elimination of quartz particles continues for many years after the last exposure.

Carcinogenicity:

The International Agency for Research on Cancer (IARC) has concluded that crystalline silica in the form of quartz or cristobalite from occupational sources should be classified as carcinogenic to humans (Group 1). This determination is based on a relatively large number of human population studies that together provide sufficient evidence. In many (although not all) of these studies, lung cancer risks were elevated and could not be explained by other factors.

The American Conference of Governmental Industrial Hygienists (ACGIH) has designated this chemical as a suspected human carcinogen (A2). Recent reviews suggest that if exposures are controlled to prevent silicosis, they will probably also prevent lung cancer.

Teratogenicity and Embryotoxicity:

No human or animal information is available. It is not anticipated to be teratogenic or embryotoxic resulting from exposures in an occupational setting.

Sensitization:

No human or animal information is available. It is not anticipated to be a sensitizer resulting from exposures in an occupational setting.

Reproductive Toxicity:

No human or animal information is available. It is not anticipated to be a reproductive toxin resulting from exposures in an occupational setting.

Mutagenicity:

A negative result was obtained in one in-vivo test in mice. Both positive and negative results have been reported in short-term in-vitro tests using bacteria and cultured mammalian cells.

Toxicologically

Synergistic Materials: There is disagreement about whether tobacco smoke increases the severity of the effect of silica dust on respiratory impairment. A synergistic effect between smoking and crystalline silica and/or silicosis and risk of lung cancer, is possible.

Section 12. Ecological Information

Toxicity	N/A
Persistence and degradability	Aquatic Acute 2. Toxic to aquatic life
Results of PBT and vPvB assessment	Not classified as PBT or vPvB.
Other adverse effects	None anticipated.

Section 13. Disposal Considerations

Waste treatment methods	Recover or recycle if possible. Dispose of contents in accordance with local, state or national legislation.
Additional Information	No information available.

Section 14. Transport Information

International Maritime Dangerous Goods Code	Not Regulated
International Civil Aviation Organization Technical Instructions for the Carriage of Dangerous Goods by Air	Not Regulated
U.S. Dept. of Transportation Regulations	Not Regulated
Canadian Transportation of Dangerous Goods Act	Not Regulated
European Agreement Concerning the International Carriage of Dangerous Goods by Road	Not Regulated

MARPOL Annex V:

Under the 7 Criteria contained within the MARPOL Annex V, this material is classified as:

	Harmful to the Marine Environment (HME)
X	**Not Harmful to the Marine Environment (non-HME)**

Section 15. Regulatory Information

Europe:

Classification according to Part 3 of Annex VI of EU regulation No. 1272/2008

Specific Target Organ Toxicity, Repeated exposure – Category 2

Hazard Pictograms: GHS08 – Health Hazard

Signal Word:	Warning
Hazard Statements:	H373: May cause damage to organs through prolonged or repeated exposure
Precautionary Statements:	Prevention: P260– Do not breathe dust/ fume/gas/mist/ vapours/spray Response: P314 –Get medical advice/attention if you feel unwell Disposal: P501 - Dispose of contents/container in accordance to local/regional/national/international regulations

Canada:
WHMIS 2015 classification
Specific Target Organ Toxicity, Repeated exposure – Category 2

Section 16. Other Information

Indications of Change:

1. Original document.
1.1 Reissued

The following acronyms may be found in this document:

ACGIH	American Conference of Governmental Industrial Hygienists
DNEL	Derived No Effect Level
LTEL	Long Term Exposure Limit
OEL	Occupational Exposure Limits
OSHA	Occupational Safety and Health Administration
PBT	PBT: Persistent, Bioaccumulative and Toxic
PNEC	Predicted No Effect Concentration
STEL	Short Term Exposure Limit
TLV-TWA	Threshold Limit Value – Time Weighted Average
vPvB	very Persistent and very Bioaccumulative
WEL	Workplace Exposure Limit (UK HSE EH40)

Safety Data Sheet prepared by:
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Note:

Vale Canada believes that the information in this Safety Data Sheet is accurate. However, Vale Europe Limited makes no express or implied warranty as to the accuracy of such information and expressly disclaims any liability resulting from reliance on such information.

1. Threshold Limit Values of the American Conference of Governmental Industrial Hygienists. 2016.
2. Describes possible health hazards of the product supplied. If user operations change it to other chemical forms, whether as end products, intermediates or fugitive emissions, the possible health hazards of such forms must be determined by the user.