Copper cathodes

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SECTION 1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier:
Name: copper
Trade name: copper cathodes
Synonyms: electrolytic copper in form of cathodes, metal plates, cuttings (compressed into blocks), copper in massive form (the particle size >1mm)
IUPAC name: copper
REACH registration No.: 01-2119480154-42-0002
UN No.: not assigned
CAS No.: 7440-50-8
WE No: 231-159-6
Index number: not assigned

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

Identified uses: for the production of: electrolytic copper, copper refined ingots dip in not forged shapes (rounds, slabs, molds etc.), production of copper suspensions and powders (including catalyst pellets) - thermal processes, hydrometallurgical and electrochemical; production of alloys; production of powder mixtures containing copper (eg. soldering pastes, pigments in paints, etc.); production of copper-containing (or semi-finished products - for example. rolling, wires, rods, profiles, pipes, sheets, cables, and foundry products, production of articles made from copper and copper-containing mixtures (eg. sinters); the use of copper as an intermediate in production of other substances containing copper, the use of copper in the form of soldering paste (using a mixture by the industrial workers); used as a catalyst (using the powder by the industrial workers); use of the finished products (by consumers) - eg. use of coins; use of the finished products (by workers) - eg. the installation of roofs, pipes, etc .; use as a coating surface spray (using a mixture in an airtight container); use of products made of copper or copper-containing particles - eg. the brake pedals.

Uses advised against: not known

1.3 Details of the supplier of the material safety data sheet:

KGHM Polska Miedź S.A.
"Głogów" Copper Smelter & Refinery
ul. Żukowicka 1
67-200 Głogów

Person responsible for preparing the MSDS: phone No.: (+48 76) 747 82 21, e-mail: karty.charakterystki@kghm.com

1.4. Emergency telephone number

Manufacturer (Poland): (48 76) 747 65 001 – available 24/7
Fire Department: 998 – available 24/7
General Emergency: 112 – available 24/7

SECTION 2. Hazards identification

2.1. Classification of the substance or mixture:

Not classified

2.2. Label elements:

None

2.3 Other hazards:

The substance does **not** meet classification criteria for PBT and vPvB.

The substance is **not** a substance identified as having endocrine disrupting properties in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605.

SECTION 3. Composition/information on ingredients

3.1. Substances

No.	Substance name	CAS No.	WE No.	Percentage content [mass fraction]	Hazard Class And Category Code(s)	H statements	Specific Conc. Limit, M-factor, ATE
1.	Copper: - in massive form (> 1mm)	7440-50-8	231-159-6	min. 99,99	-	-	-

3.2. Mixtures

n/a

SECTION 4. First Aid measures

4.1 Description of first aid measures:

Copper in massive form is not hazardous. During production and some uses, the following hazardous derivatives may occur/be formed: respirable copper-bearing particles and soluble copper compounds. This section also considers potential hazards of copper-bearing materials and copper compounds (referred to as “copper”), relevant to the production and use of copper massive.

Following inhalation:

Take the victim out of the place of exposure. Provide calmness in any position. Protect against loss of body heat. If the victim not breathing, provide artificial respiration using respirator (do not use mouth-to-mouth method). Necessary medical assistance.

Following skin contact:

Remove contaminated clothing. Immediately clean contaminated skin with a lot of running water at room temperature. In case of skin changes, seek dermatologist attention.

Following eye contact:

Immediately rinse with a lot of cool, running water, for about 15 minutes. Avoid intensive water jet because conjunctiva may become mechanically damaged. In the event of changes in the eye and / or if discomfort continues, consult a physician.

Following ingestion:

Give plenty of lukewarm water and induce vomiting. Get medical attention if any discomfort occurs.

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

Copper in massive form is not hazardous However, during production and some uses there may be risks associated with the presence of respirable particles of copper and its compounds. This section also considers potential hazards of copper-bearing materials and copper compounds (referred to as “copper”), relevant to the production and use of copper massive.

Acute intoxication symptoms:

Respiratory tract: copper dust and fumes cause irritation of eyes, nose and respiratory tract and so-called copper fever (flu-like symptoms); copper fever symptoms appear when a content of 0,1 mg of copper in 1 m^3 of the inhaled air.
Alimentary system: metallic taste in mouth, nausea, vomiting, diarrhea.
Eyes contact: lacrimation, irritation.
Long-term exposure:
Prolonged exposure of the eyes (dust, fumes) may cause discoloration of the cornea and lens. Long-term exposure to copper fumes by inhalation and prolonged consumption of copper more than the
recommended dose can cause metabolic changes, changes in the liver, kidney damage, brain, coronary and myocardial infarction.

4.3 Indication of any immediate medical attention and special treatment needed:
If the victim is unconscious, make sure that the respiratory tract is not obstructed and place the victim in a recovery position. Provide medical assistance.

SECTION 5. Firefighting measures

5.1 Extinguishing media:
Suitable extinguishing media: Non-flammable substance. Use firefighting measures appropriate to the surrounding materials.
Unsuitable extinguishing media: Not known. Do not use water on molten metal.

5.2 Special hazards arising from the substance or mixture:
The substance is fire-dangerous only in the form of vapors and dust.

5.3 Advice for fire-fighters:
Personnel participating in extinguishing a fire should wear protective, gas-tight clothes and apparatus isolating respiratory ways.
Follow the nature and size of the adjacent objects fire.
Additional information: Notify those in the surroundings about the fire. Remove all personnel not participating in the breakdown liquidation procedure from the area of hazard. Call fire department or police department.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures:
6.1.1 For non-emergency personnel: Do not inhale dusts. In case of choosing evacuation route consider the direction of the dust/fume movement.
6.1.2 For emergency responders: Do not inhale dusts. Personnel participating in rescue operation should wear protective, gas-tight clothes and apparatus isolating respiratory ways.

6.2 Environmental precautions:
Do not let the product penetrate the sewage system, ground and surface waters and soil. In case of accident, protect the substance against release to the environment.

6.3 Methods and material for containment and cleaning up:
Collect maximum quantity to proper containers in order to re-use it.

6.4 Reference to other sections
Personal protection equipment described in section 8.2.2
Disposal considerations in section 13.

SECTION 7. Handling and storage

7.1 Precautions for safe handling:

Wear protecting clothes and gloves. When handling the substance, do not drink, eat, smoke. Avoid generation and spreading of dust in the workplace. Avoid inhalation of dust and small particles, avoid contact with eyes. Avoid contact with molten material. Do not use water on molten material. Processes such as melting, burning, cutting, brazing, grinding and machining can generate fumes and dusts. Provide adequate ventilation. Obey the rules of safety and hygiene.

7.2 Conditions for safe storage, including any incompatibilities:

Do not store near: acetylene, acids and bases and their vapours and salts. Avoid contact with metals less precious, particularly when when there is an access of moisture.

7.3 Specific end use(s):

Identified uses are listed in section 1.2.

SECTION 8. Exposure control/personal protection

8.1 Control parameters:

The following current national occupational exposure limit values apply (Poland):

No.	Substance name	TLV-TWA [mg/m^3]	TLV-STEL [mg/m^3]
1.	Copper and its inorganic compounds – calculated as Cu:	0.2	-

Legal basis:

Regulation of the Minister of Family, Labour and Social Policy of June 12th, 2018 on the highest allowable concentrations and intensities of agents harmful for health at the workplace (Official Journal of 2018 item 1286);

The following current national occupational exposure limit values apply (recipients):

No.	Substance name	TLV-TWA [mg/m^3]	TLV-STEL [mg/m^3]
1.	Germany: - inhalable fraction:	0.1	-
2.	France: - copper fumes: - dust (as Cu):	0.2 1	-
3.	Czech Republic: - copper fumes: - dust (as Cu):	0.1 1	-

Note:

The recipient of the product is obliged to control the concentrations and/or intensities of harmful substances in the work environment with the frequency and range necessary to determine the exposure level of workers in accordance with the applicable national legislation.

Derived No Effect Levels (DNELs) and Predicted No Effect Concentrations (PNECs):

Exposure pattern	Route	Descriptor	DNEL / PNEC

Human – Long-term – systemic effects	Oral, dermal and inhalation	Internal dose DNEL (Derived No Effect Level) Using absorption factors of 25% for oral, 100% for inhalation (respirable) and 0.03% for dermal exposure routes	0.041mg Cu/kg B wt/d
Human – Short-term – systemic effects	Oral, dermal and inhalation	Internal dose DNEL (Derived No Effect Level) Using absorption factors of 25% for oral, 100% for inhalation (respirable) and 0.03% for dermal exposure routes	0.082mg Cu/kg B wt/d
Human – Short-term – effects- drinking water	Oral	NOAEL for drinking water	4 mg/l
Environmental	Freshwater	PNEC (Predicted No Effect Concentration) Includes a default bio-availability correction	7.8 µg dissolved Cu/L
Environmental	Marine water	PNEC (Predicted No Effect Concentration) Includes a default bio-availability correction	5.2 µg dissolved Cu/L
Environmental	Sediment freshwater	PNEC (Predicted No Effect Concentration) Includes a default bio-availability correction	87 mg Cu/kg dry wt
Environmental	Sediment estuarine	PNEC (Predicted No Effect Concentration)	288 mg Cu/kg dry wt
Environmental	Sediment marine	PNEC (Predicted No Effect Concentration)	676 mg Cu/kg dry wt
Environmental	Soil	PNEC (Predicted No Effect Concentration) Includes a default bio-availability correction	65.5 mg Cu/kg dry wt
Environmental	STP	PNEC (Predicted No Effect Concentration)	230 g dissolved Cu/L

8.2 Exposure controls:

8.2.1 Appropriate engineering controls at industrial settings

During the production and processing of electrolytic copper ensure adequate local exhaust ventilation with housing in the area of vapours/dust emission to aerial environment and general ventilation of the room. Processes such as melting, grinding, mechanical working or packaging may generate the formation of dust and fumes.

Any deposit of dust which cannot be avoided should be regularly removed preferably using appropriate industrial vacuum cleaners or central vacuum systems.

Waste air should be released into the atmosphere only after it has passed through suitable dust separators.

Waste water generated during the production process or cleaning operations should be collected and should preferably be treated in an on-site waste water treatment plant which ensures efficient removal of copper.

8.2.2 Individual protection measures, such as personal protective equipment

Eye/face protection:

Not required. If there is a possibility of exposure to dust, wear goggles protect against fine dust. Do not wear contact lenses.

Hand protection:

Working gloves.

Skin protection:

Working clothes.

Respiratory protection:

If there is a possibility of exposure to dust use half-mask with filter of appropriate class for the designated concentrations in the air.

Thermal hazards:

Not applicable.

Hygiene measures:

Remove contaminated clothing. Clean contaminated clothing before reuse. After handling the product wash hands and face. Do not eat or drink while handling the product.

Additional Information:

During the production and processing of electrolytic copper use personal protection measures appropriate to the hazards in accordance with applicable law.

8.2.3. Environmental exposure controls:

Avoid release to the environment. Environmental exposure should be controlled in accordance with the national legislation on environmental protection.

SECTION 9. Physical and chemical properties

9.1 Information on basic physical and chemical properties:

a) *Physical state*: solid;
b) *Colour:* copper colour;
c) *Odour*: odourless;
d) *Melting point/freezing point:* 1059 – 1069 °C; freezing point not determined;
e) *Boiling point or initial boiling point and boiling range:* n/a to solids with melting point > 300 °C ;
f) *Flammability*: n/a inflammable product;
g) *Lower and upper explosion limit:* n/a;
h) *Flash point:* n/a;
i) *Auto-ignition temperature:* n/a;
j) *Decomposition temperature: decomposition starts at 1059 °C;*
k) *pH:* n/a;
l) *Kinematic viscosity:* n/a;
m) *Solubility: insoluble*;
n) *Partition coefficient n-octanol/water (log value):* n/a;
o) *Vapour pressure:* 0.013 Pa at 840 °C;
p) *Density at 20 °C: 8,78g/cm^3;*
q) *Relative vapour density:* n/a;
r) *Particle characteristics:* > 1mm.

9.2 Other information:

None

SECTION 10. Stability and reactivity

10.1. Reactivity:

Non-reactive substance.

10.2. Chemical stability:

The substance is stable.

10.3 Possibility of hazardous reactions:

Dangerously reacts with acetylene forming explosive acetylides. With most acids forming soluble copper compounds.

10.4 Conditions to avoid:

Avoid dust formation and contact with acids.

10.5 Incompatible materials:

Acetylene, halogens, ammonia, oxidizing acids, sulfur, hydrogen sulfide. In the presence of air reacts with the hydrofluoric and hydrochloric acids. In moist air reacts with carbon dioxide which leads to covering the characteristic green patina and reacts with sulfur dioxide which leads to covering the black coating of copper sulfide.

10.6 Hazardous decomposition products:

The element Cu^0 does not decompose but may be transformed into other metal forms (e.g. Cu^{2+}).

SECTION 11. Toxicological information

The toxicological information was obtained from Chemical Safety Report for copper, which was prepared for REACH registration purpose.

Most of the available hazard data are related to exposure of soluble copper compounds (e.g. copper sulphate) and fine copper flakes, coated with zinc stearates (particle size around 5µm). For the hazard profile of copper in massive forms, information on solubility, bioaccessibility and bioavailability is combined with the hazard profile of soluble copper compounds in a read-across approach to assess its potential hazards

11.1 Information on hazard classes as defined in Regulation (EC) No 1272/2008:

a) Acute toxicity:

ORAL: At high levels, solubilised copper-ions may induce gastro-Intestinal effects. Acute oral effects, assessed from animal studies using CuO, copper sulphate and coated copper flakes are available. Comparison of the toxicity profiles demonstrates the importance of solubility/bio-accessibility for read-across of toxicity data among copper-bearing substances. The available animal data combined with in-vitro bio-accessibility data permitted the assessment of the acute toxicity of copper in powder and massive form.

The assessment concluded that, according to the Regulations (EC) No 1272/2008 and 67/548/EEC, copper sulphate and coated copper flakes meet the criteria as acute harmful by oral intake (LD50 rats>300 mg/kg body weight). The assessment further concluded that, according to Regulations (EC) No 1272/2008 and 67/548/EEC, copper (massive and powder forms) and CuO do not meet the criteria for classification after oral intake (LD50 > 2000 mg/kg body weight).

Acute gastrointestinal effects associated with copper sulphate additions to drinking water were investigated in humans (Araya et al, 2001 and 2003) and a NOAEL of 4mg Cu/L was derived. At higher doses (6 to 8 mg Cu as CuSO4/L, administered as a bolus on an empty stomach) nausea was the most frequently reported symptom (10% at 6 mg/L and 18% at 8 mg/L) and generally occurred within 15 minutes of administration. Other gastrointestinal symptoms (vomiting, diarrhoea and abdominal pain) were reported less frequently and abdominal pain showed no relationship to concentration.

INHALATION: Available acute inhalation toxicity data on coated copper flakes and copper oxychloride demonstrate that these soluble materials need to be classified as “harmful by

inhalation" (LD50 rats 1-5 g/m3 air). The inhalation toxicity was characterized by local damage at the site of predominant deposition of particles (effect on respiratory tract and in lungs).
Copper massive has a particle size >10 µm and down-stream uses do not lead to particles with d50 <10µm. Therefore, according to Regulations (EC) No 1272 and 67/548/EEC, these do not meet the criteria for classification as harmful by inhalation.
DERMAL: Consideration of available acute dermal toxicity data on copper (coated copper flakes Sanders, 2001b)) and copper compounds (copper sulphate and copper oxide (LD50>2000 mg/kg body weight) against EU classification criteria, according to Regulations (EC) No 1272/2008 and 67/548/EEC, leads to the conclusion that copper nor any of the tested copper compounds require classification for acute lethal effects after dermal exposure.
The classification criteria, for copper in massive form and copper powder, according to Regulations (EC) No 1272/2008 and 67/548/EEC on acute toxicity, are therefore not met.

b) Skin corrosion/irritation:

Animal data (coated copper flakes and CuO) have demonstrated that, according to Regulations (EC) No 1272 and 67/548/EEC, "copper" is not a skin irritant.
The classification criteria, for copper in massive form and copper powder, according to Regulations (EC) No 1272/2008 and 67/548/EEC on skin/eye irritation are therefore not met.

c) Serious eye damage/ eye irritating:

Animal studies with coated copper flakes and CuO induced slight reversible eye irritation effects. Following the criteria, according to the Regulations (EC) No 1272 and 67/548/EEC, the coated copper flakes and CuO are not considered as an eye irritant.
*The classification criteria, for copper in massive form and copper powder, according to Regulations (EC) No 1272/2008 and 67/548/EEC on skin/eye irritation are therefore not met***.**

d) Respiratory tract or skin sensitization:

Animal data (coated copper flakes (Sanders 2001e) and CuO) have demonstrated that, according to Regulations (EC) No 1272/2008 and 67/548/EEC, "copper" is not a skin sensitizer.
The classification criteria, for copper in massive form and copper powder, according to Regulations (EC) No 1272/2008 and 67/548/EEC on sensitization are therefore not met

e) Germ cell mutagenicity:

Public domain data indicate that copper sulphate is negative in vitro in bacterial cell reverse mutation assays, and in several other bacterial cell assays up to and including cytotoxic doses (1000-~3000 µg/plate). Similar negative findings have also been reported for copper chloride. Results from in vitro mammalian cell tests show that copper sulphate is genotoxic only at high, cytotoxic concentrations (up to 250 mg/l).
Two in vivo genotoxicity studies performed on a soluble copper compound (copper sulphate), in accordance to respectively OECD 486 and EU B.12 were negative.
The classification criteria for copper in massive form and copper powder, according to Regulations (EC) No 1272/2008 and 67/548/EEC on germ cell mutagen are therefore not met.

f) Carcinogenicity:

All available studies on the carcinogenicity of copper are public domain studies but study qualities are limited due to shorter exposure periods (<2 years) and small group sizes. However, using these studies in a weight of evidence approach, it was concluded that copper compounds do not raise concerns with respect to carcinogenic activity.

The classification criteria for copper in massive form and copper powder, according to Regulations (EC) No 1272/2008 and 67/548/EEC on carcinogenicity are therefore not met.

g) Reproductive toxicity:

A study (Mylchreest, 2005) indicates that the no-observed-adverse-effect level (NOAEL) for reproductive toxicity of a soluble copper compound (copper sulphate pent hydrate) in rats is > 1500 mg/kg food or >24 mg Cu/kg bw/d, the highest dose tested. At the highest dose, slight non-reproductive toxicity effects (transient effect on spleen weight) were observed.

The classification criteria for copper in massive form and copper powder, according to Regulations (EC) No 1272/2008 and 67/548/EEC on reproductive toxicity are therefore not met.

h) Specific target organ toxicity — Single exposure:

The effects following acute toxicity (oral and inhalation – see above) have been used for the classification as harmful. The local oral and inhalation effects resulted in mortality.

The classification criteria, for copper in massive form and copper powder, according to Regulations (EC) No 1272/2008 and 67/548/EEC on STOT-SE are therefore not met.

i) Specific target organ toxicity — Repeated exposure:

NOAELoral rat = 16 mg Cu /kg body weight/day. Following repeated administration of CuSO4 in the feed for 13 weeks produced effects in the fore stomach, liver and kidney. Inflammation of the liver occurred in male and female animals at 260 mg CuSO4/kgBW/day and above. The incidence and severity of the effects were dose-dependent. This study was used in the subsequent calculation of an oral and systemic DNEL (including a Safety factor of 100 and an oral absorption of 25%) of 0.041 mg Cu/kg body weight/day.

The classification criteria, for copper in massive form and copper powder, according to Regulations (EC) No 1272/2008 on Specific Target Organ Toxicity are therefore not met.

j) Aspiration hazard

INHALATION: Copper massive and its marketed downstream use products have a d50 particle size >10 µm and therefore do not meet the criteria for acute inhalation classification. In specific cases (e.g. during production), dusts, mists and fumes may be produced. The absorption of the respirable fraction (fumes) is considered to be complete (100%). Absorption of the "inhalable" fraction depends on the particle size and the Multiple Path Model of Particle Deposition (MPPD)) can be used to quantify the particle dependent absorption.

ORAL: The solubility of copper massive forms in gastric fluid is low. In-vitro bio-accessibility of soluble copper compounds, copper powders and copper massive forms (various sizes) in gastric fluid (in accordance to ASTM D5517-07), demonstrated that, for massive forms, the release of copper ions in gastric fluids, was only < 0.1% of its total potential release.

DERMAL: A dermal absorption of 0.3% for soluble and insoluble copper substances in solution or suspension is observed from in- vitro percutaneous tests on human skin (Roper 2003; Cage 2003). For the dry exposure scenarios applicable to copper powders, the dermal absorption value of 0.03% applies.

The classification criteria, for copper in massive form and copper powder, according to Regulations (EC) No 1272/2008 on Absorption are therefore not met.

11.2. Information on likely routes of exposure:

Routes of absorption for copper: inhalation, ingestion (swallowing), skin, eyes.

SECTION 12. Ecological information

12.1. Toxicity:

The ecotoxicological information was obtained from Chemical Safety Report for copper, which was prepared for REACH registration purpose.

Most of the available hazard data are related to exposure of soluble copper compounds (e.g. copper sulphate). For the hazard profile of copper massive forms (assessed from a sphere of 1mm diameter), information on solubility and bioavailability are combined with the hazard profile of soluble copper compounds in a read-across approach to assess its potential hazards.

Acute aquatic toxicity test results and environmental classification:

The acute toxicity of soluble copper ions was assessed from studies on soluble copper compounds. From a literature search 451 high quality L(E)C50 values were retained. For the algae 66 individual data points were selected for 3 standard species (*Pseudokirchnerella subcapitata*, *Chamydomonas reinhardtii* and *Chlorella vulgaris*). For the invertebrates 123 individual data points were selected for 2 standard species*(Ceriodaphnia dubia* and *Daphnia magna*) and for the fish 262 individual data points were selected for 5 standard species (*Oncorhynchus mykiss, Pimephales promelas, Lepomis macrochirus, Brachydanio rerio* and *Cyprinus carpio*). The data were treated and summarized in accordance with the CLP guidance (2009) to derive the pH dependent acute reference value. The lowest species-specific geometric mean L(E)C50 reference was obtained for an invertebrate (*Ceriodaphnia dubia*) at pH 5.5-6.5 with an acute L(E)C50 of 25.0 µg Cu/L.

To assess the environmental classification of copper in massive form, the copper release from the 7 days transformation/dissolution data of copper in massive forms (6.7 µg Cu/L at 100mg/L, pH6) was combined with the acute reference value for the copper ions (25 µg Cu/L).

The assessment demonstrates that, according to Regulations (EC) No 1272/2008 and 67/548/EEC, copper massive forms do not need to be classified for acute environmental hazards.

In accordance with the EU CLP guidelines (2009), chronic classification applies if the substance is persistent or bio-accumulative. For "copper" it has been be demonstrated that the bio-available copper-ions are rapidly removed from the water column. Copper is an essential nutrient, copper concentrations are very strongly regulated and copper is not bio-magnified across the food-web. The "bio-accumulation" criteria therefore do not apply the "copper".

Based on the assessment according to Regulations (EC) No 1272/2008 and 67/548/EEC, Copper massive does not meet the classification for chronic aquatic toxicity.

Chronic freshwater toxicity test results and PNEC derivation:

The chronic toxicity of soluble copper ions was assessed from studies on soluble copper compounds. 139 individual NOEC/EC10 values resulting in 27 different species-specific soluble Cu-ions NOEC values, covering different trophic levels (fish, invertebrates and algae) were used for the PNEC derivation. The large intra-species variability in the reported single species NOECs was related to the influence of test media characteristics (e.g., pH, dissolved organic carbon (DOC), hardness) on the bioavailability and thus toxicity of copper. Species-specific NOECs were therefore calculated after normalizing the NOECs towards a series of realistic environmental conditions in Europe (typical EU scenario's, with well-defined pH, hardness and DOC). Such normalization was done by using chronic copper bioavailability models (Biotic Ligand Models), developed and validated for three taxonomic groups (fish, invertebrates and algae) and additional demonstration of the applicability of the models to a range of other species. The species-specific BLM-normalized NOECs were used for the derivation of log-normal Species Sensitivity Distributions (SSD) and HC5 values

(the median fifth percentile of the SSD), using statistical extrapolation methods to derive a PNEC. The data allow the derivation of PNECs for the typical EU scenario ranging between 7.8 to 22.1 µg dissolved Cu/L. Additional BLM scenario calculations for a wide range of surface waters across Europe further demonstrated that the HC5 of 7.8 µg dissolved Cu/L, is protective for 90% of the EU surface waters and can thus be considered as a reasonable worst case for Europe in a generic context.

Copper threshold values were also derived for three high quality mesocosm studies, representing lentic and lotic systems. The mesocosm studies included the assessment of direct and indirect effects to large variety of taxonomic group and integrate potential effects from uptake from water as well as from food. The results confirm the BLM normalized single species threshold values.

Conclusion: *a value of 7.8 µg dissolved Cu/L is the default chronic freshwater PNEC, to be used to assess local risks. The assessment can be refined if information on local water chemistry (dissolved organic carbon, pH, calcium, magnesium, sodium and alkalinity) is available.*

Chronic marine waters toxicity test results and PNEC derivation:

The chronic toxicity of soluble copper ions was assessed from studies on soluble copper compounds. 51 high-quality chronic NOEC/EC10 values, resulting in 24 different species-specific soluble Cu-ions NOEC values covering different trophic levels (fish, invertebrates, algae), were retained for the PNEC derivation. NOEC values were related to the Dissolved Organic Carbon (DOC) concentrations of the marine test media. Species-specific NOECs were therefore calculated after DOC normalizing of the NOECs. These species-specific NOECs were used for the derivation of species sensitivity distributions (SSD) and HC5 values, using statistical extrapolation methods. The organic carbon normalisation was carried out at a DOC level typical for coastal areas (2 mg/l) and resulted in an HC5 value of 5.2 µg Cu/L.

A Copper threshold value was also recently derived from a high quality marine mesocosm study. The mesocosm studies included the assessment of direct and indirect effects to large variety of taxonomic group and integrate potential effects from uptake from water as well as from food. The results confirm the DOC normalized single species threshold values.

Conclusion: *a value of 5.2 µg dissolved Cu/L is the default chronic marine water PNEC, to be used to assess local risks. The assessment can be refined if the dissolved organic carbon concentration of the local environment is available.*

Chronic freshwater sediment toxicity test results and PNEC derivation:

The sediment PNEC included using a weight of evidence approach considering different sources and tiered approaches of information: (1) sediment ecotoxicity data from spiking sediments with of soluble copper compound, (2) pelagic ecotoxicity data in combination with water-sediment partitioning coefficients (Kd values) derived through different approaches and (3) mesocosm/field ecotoxicity.

High-quality chronic benthic NOECs for six benthic species, representing 62 NOEC values were retained for the PNEC derivation. NOEC values were related to sediment characteristics (e.g., Organic Carbon (OC) and Acid Volatile Sulphides (AVS)), influencing the bioavailability and thus toxicity of copper to benthic organisms. The derivation of the freshwater HC5 sediment for copper was therefore based on the OC-normalized dataset, containing only low-AVS sediments.

Conclusion: *a value of 87 mg Cu/kg dry weight is the default chronic freshwater sediment PNEC, to be used to assess local risks. The assessment can be refined if the organic carbon concentration and the Acid Volatile Sulphide concentrations of the local sediment is available.*

Chronic terrestrial toxicity test results and PNEC derivation:

Chronic terrestrial toxicity is derived from spiking of soils with soluble copper compounds. A high-quality dataset of 252 individual chronic NOEC/EC10 values from 28 different species and processes representing different trophic levels (i.e., decomposers, primary producers, primary consumers) has been retained for the PNEC derivation. The observed intra-species differences in toxicity data were related to differences in bioavailability: the latter related to differences in soil properties and to differences in ageing and application mode and rate.

The soil property best explaining the variability in toxicity for most of the endpoints was the eCEC (effective Cation Exchange Capacity). To account for the observed difference between lab-spiked soils and field-contaminated soils, a conservative leaching-ageing factor of 2 was agreed based on test data from the mechanistic research on ageing and ionic strength (leaching) effects. For the normalisation of the ecotoxicity data, first the leaching-ageing factor was applied on all added NOEC/EC10 values. These adjusted values, after addition of the respective Cu background concentrations, were subsequently normalised to a wide range of EU soils using the relevant regression (bio) availability models, generating soil-type specific HC5 values and a derivation of the PNEC. Species Sensitivity Distributions were constructed using the normalised NOEC/EC10 data. HC5 values from log-normal distributions ranging between 65.5 and 150 mg Cu/kg dry weight were obtained.

A total of eight single species studies were available in which the toxicity of Cu to micro-organisms, invertebrates and plants in field-contaminated aged soils was investigated for a wide range of European soil types (peaty, sandy, clay). A total of five multi-species studies were available, three of which studied the effects of copper in freshly spiked soils and two in field contaminated aged soils. Invertebrates, plants and micro-organisms were studied. Single-species and multi-species field studies indicate that effects did not occur at an exposure level at the HC5value.

See Copper Risk assessment Report

Conclusion: *a value of 65.5 mg Cu/kg dry weight is the default chronic soil PNEC, to be used to assess local risks. The assessment can be refined if the pH and Cation Exchange Capacity of the local soil is available.*

12.2. Persistence and degradability: Copper cannot be degraded, but may be transformed between different phases, chemical species, and oxidation states.

In aquatic environment the copper ions form with present in the water sulfide ions and carbonate ions sparingly soluble salts that settle into the benthic deposit.

12.3. Bioaccumulative potential:

In accordance with Chemical Safety Report copper has not bioaccumulative potential.

12.4. Mobility in soil:

Copper ions are strongly bonded by a matrix of the soil. The binding depends on the properties of the soil.

12.5. Results of PBT and vPvB assessment:

The substance is tot classified as PBT or vPvB.

12.6. Endocrine disrupting properties:

Not applicable. The substance is **not** a substance identified as having endocrine disrupting properties in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605.

12.7. Other adverse effects:

Copper is not expected to contribute to ozone depletion, ozone formation, global warming or acidification.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Proceedings in the case of waste arising: Do not dispose of to the sewage system. Do not let the substance to contamination of surface and ground water or soil. Do not dispose of at municipal landfills. Consider re-use. Recovery or disposal carried out in accordance with applicable regulations.

Waste management according to the Directive of the European Parliament and Council 2008/98/EC of November 19th, 2008 on waste (Official Journal EC L 312 of 22.11.2008, with subsequent amendments).

Disposal emptied packages: recycle steel securing bands.

SECTION 14: Transport information

The substance is not subject to regulations concerning the transport of dangerous goods.

14.1. UN number or ID number:: n/a

14.2. UN proper shipping name: n/a

14.3. Transport hazard class(es): n/a

14.4. Packing group: n/a

14.5. Environmental hazards: n/a

14.6. Special precautions for user: n/a

14.7. Maritime transport in bulk according to IMO instruments: n/a

SECTION 15: Regulatory information

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

Commission Regulation (EU) 2020/878 of 18 June 2020 amending Annex II to Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Act of February 25th, 2011 on chemical substances and their mixtures (Official Journal 11.63.322); Regulation (EC) No. 1907/2006 of the European Parliament and Council of December 18th, 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC; Regulation of the European Parliament and Council (EC) No. 1272/2008 dated December 16th, 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006; Regulation of the European Parliament and Council (EC) No 1336/2008 of 16 December 2008 amending Regulation (EC) No 648/2004 in order to adapt it to Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures (Official Journal L 354 from 31.12.2008); Regulation of the Minister of Labour and Social Policy of June 6th, 2014 on the highest allowable concentrations and intensities

of substances harmful for health in the work environment (Official Journal No. 817); Act of August 19th, 2011 on transportation of hazardous goods (Official Journal 227.1367); Act of December 14th, 2012, on waste (Official Journal 0.21.2013).

15.2. Chemical safety assessment

Chemical safety assessment of the substance has been carried out.

SECTION 16: Other information

MSDS has been updated in accordance with Commission Regulation (EU) 2020/878 of 18 June 2020 amending Annex II to Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH).

Explanations of abbreviations and acronyms used in the MSDS:

CAS number – means numerical identification assigned to chemical substance by the American organization named Chemical Abstract Service (CAS), enabling substance identification.

Index number – it is an identification code given in part 3 of the annex VI to the Regulation of the European Parliament and Council (EC) No. 1272/2008 dated December 16th, 2008, on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006;

WE number – the number assigned to chemical substance in EINECS -. European Inventory of Existing Chemical Substances, or the number assigned to chemical substance in ELINCS – European List of Notified Chemical Substances or the number in chemical substances inventory included in "No-longer polymers" document.

Registration number – number given by ECHA after substance/intermediate registration by the manufacturer/importer according to REACH Regulation.

UN number – unequivocal marking of hazardous substances and goods assigned by United Nations Central Committee to provide international recognition and use.

Name according to IUPAC – name of a substance given by IUPAC - International Union of Pure and Applied ChemistryCommittee

TLV-TWA – the highest admissible concentration/threshold limit value – weighted average value – concentration of toxic chemical whose impact on a worker during 8-hour daily shift and average weekly time of work provided in the Labour Code during the period of his occupational activity should not cause negative changes of his health condition and of health condition of his next generations.

TLV-STEL – the highest admissible short term concentration/short term exposure limit – weighted average of concentration of the specified, toxic chemical compound which should not cause negative changes of a worker's health if present in the work environment for not longer than 15 minutes and not more often than twice per shift with occurrences separated by more than 1 hour. and not more often than twice per shift with occurrences separated by more than 1 hour.

LD_{50} – lethal dose - dose of toxic substance expressed in milligrams per kilogram of body mass necessary to kill 50% of the examined population within specified time.

LC_{50} – lethal concentration - concentration of a substance in the inhaled air, expressed in milligrams per litre, which causes death of 50% of the examined population after specified period of exposure.

EC_{10} – effect concentration - substance concentration expressed in milligrams per litre causing the given pharmacological effect (e.g. inhibition of growth) at 10% of the examined population within specified time.

NOEC – no effect concentration - concentration of the substance expressed in milligrams per litre, at which no toxic effects can be observed.

Sources of information used during preparation of the MSDS:

- Own results of qualitative and quantitative analyses of the substance;
- Copper Chemical Safety Report,
- ECHA: https://echa.europa.eu/pl/information-on-chemicals/registered-substances;
- TOXNET: http://toxnet.nlm.nih.gov/.

Necessary training: Post-related training within the scope of safe use of a substance considering its hazardous properties for human and the environment.

Information contained in the material safety data sheet is to describe the product within the scope of safety requirements. User is responsible for taking any steps in order to meet the provisions of the national law and to create safe conditions for use of the product. User is held responsible for effects resulting from improper application of this product.

Further information can be obtained under the telephone numbers given in section 1.