

**Copper sulphate pentahydrate**

Date of issue: 04.06.2003

Revision No. / Revision date: 11 / 01.09.2015

**SECTION 1. Identification of the substance/mixture and of the company/undertaking****1.1 Product identifier:****Trade name:** COPPER SULPHATE PENTAHYDRATE**IUPAC name:** Copper(II) sulphate(VI) pentahydrate**UN No.:** 3077**CAS No.:** 7758-99-8**WE No.:** -**Index number:** 029-004-00-0**REACH registration No.:** 01-2119520566-40-0004**1.2 Relevant identified uses of the substance or mixture and uses advised against**

Identified uses: for production of: absorbents, ceramics, coatings, inks, cosmetics, fertilisers, glass, lubricants and greases, putties, fillers, construction chemicals, polishes and waxes, other compounds and fine chemicals, rubber and plastics, washing and cleaning products, catalysts, textile and leather dyes, adhesives, galvanic, chemical reagents, mineral flotation, raw material for non-ferrous smelting, non-metal surface treatment, pigments, processing aids, photochemistry, water treatment.

Uses advised against: Product mustn't be used for biocidal purposes.

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

Producer: KGHM Polska Miedź S.A.  
„Legnica” Copper Smelter & Refinery  
ul. Złotoryjska 194  
59-220 Legnica

Phone numbers:

**Copper Electrorefining Department Manager:** (48 76) 747 53 01 – available: Mon. – Fri. 7<sup>15</sup> – 15<sup>15</sup>,

**Customer Service and Finished Products Warehouse Section Manager:** (48 76) 747 28 00 – available: Mon. – Fri. 7<sup>15</sup> – 15<sup>15</sup>,

Fax No: (48 76) 747 20 05

Person responsible for the MSDS: phone No.: (+48 76) 747 52 06,

e-mail: [karty.charakterystyki@kg hm.pl](mailto:karty.charakterystyki@kg hm.pl)

**1.4. Emergency telephone number**

**(48 76) 747 50 02** – Producer 24 hours emergency telephone number.

**112** (general emergency telephone number), **998** (Fire Service), **999** (Ambulance).

**SECTION 2. Hazards identification****2.1. Classification of the substance or mixture:**

Classification according to Regulation No. 1272/2008 (CLP):

**Carc 1A; H350** – May cause cancer;

**Repr 1B; H360D** – May damage the unborn child;

**Acute tox 4; H302** – Harmful if swallowed;

**Eye Damage 1; H318** – Causes serious eye damage;

**Skin Sens 1; H317** – May cause an allergic skin reaction;

**STOT RE 2; H373** – May cause damage to organs through prolonged or repeated exposure;

**Aquatic acute 1; H400** – Very toxic to aquatic life;

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**Aquatic chronic 1; H410** – Very toxic to aquatic life with long lasting effects;

Classification according to Directive 67/548/EWG:

**Carc. Cat. 1; R49** – May cause cancer by inhalation;

**Repr. Cat. 2; R61** – May cause harm to the unborn child;

**Xn;R22** – Harmful if swallowed;

**Xi; R41** – Risk of serious damage to eyes

**R43** – May cause sensitization by skin contact

**Xn; R48/20** – Danger of serious damage to health by prolonged exposure; Toxic by inhalation;

**N; R50/53** – Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

**2.2. Label elements:**



Signal Word: „DANGER”

Hazard Statements (H):

**H350** – May cause cancer.

**H360D** – May damage the unborn child.

**H302** – Harmful if swallowed.

**H318** – Causes serious eye damage.

**H317** – May cause an allergic skin reaction.

**H373** – May cause damage to organs through prolonged or repeated exposure.

**H410** – Very toxic to aquatic life with long lasting effects.

Precautionary Statements (P):

**P201** – Obtain special instructions before use.

**P308+313** – If exposed or concerned: Get medical advice/attention.

**P501** – Dispose of contents/container to component manufacturer.

**P273** – Avoid release to the environment.

**P260** – Do not breathe dust.

**2.3 Other hazards:**

May irritate skin.

Hazards not classified by current criteria: none

**SECTION 3. Composition/information on ingredients**

**3.1. Substances**

In accordance with Regulation No. 1272/2008 (CLP)

Composition	Percentage	Symbols	Hazards statements
<b>CuSO<sub>4</sub> * 5 H<sub>2</sub>O</b> CAS Number: 7758-99-8 EC Number: 231-847-6 Index Number: 029-004-00-0	Over 85%	Acute Tox.4 Eye Damage 1 Aquatic Acute 1 Aquatic Chronic 1	302 318 400 410
<b>NiSO<sub>4</sub></b> CAS Number: 7786-81-4	0.3 – 0.5%	Carc. 1A Muta. 2	H350i H341

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EC Number: 232-104-9 Index Number: 028-009-00-5		Repr. 1B STOT RE 1 Acute tox 4 Skin Irrit 2 Resp Sens 1 Skin Sens 1 Aquatic Acute 1 Aquatic Chronic 1	H360d H372 H302; H332 H315 H334 H317 H400 H410
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In accordance with Directive No. 1999/45/EEC

Composition	Percentage	Symbols	R-phrases
<b>CuSO<sub>4</sub> * 5 H<sub>2</sub>O</b> CAS Number: 7758-99-8 EC Number: 231-847-6 Index Number: 029-004-00-0	Over 85%	Xn; Xi; N	22 41 50/53
<b>NiSO<sub>4</sub></b> CAS Number: 7786-81-4 EC Number: 232-104-9 Index Number: 028-009-00-5	0.3 – 0.5%	Carc. Cat. 1; Muta. Cat. 3; Repr. Cat. 2; T; Xn; Xi; N	49-61-20/22-38-42/43-48/23-68-50/53

**3.2. Mixtures**

n/a

**SECTION 4. First Aid measures**
**4.1 Description of first aid measures:**

**Inhalation:** First aid: Remove victim immediately from source of exposure. Provide rest in a pitting position. Get medical attention immediately.

**Ingestion:** First aid: Give plenty of lukewarm water and induce vomiting. Get medical attention immediately.

**Eye contact:** First aid: Promptly wash eyes with plenty of lukewarm water for 15 minutes. Make sure to remove any contact lenses from the eyes before rinsing. Avoid using pressure water due to risk of eye damage. Get medical attention immediately.

**Skin contact:** First aid: Remove contaminated clothing, wash the skin immediately with cold water. Get medical attention if the skin becomes irritated.

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

Possibility of increased blood pressure and abdominal pain (colic) usually preceded by constipation lasting for several days. Acute poisoning may result in liver, kidneys and central nervous system damage. Changes in peripheral nerves mainly of lower limbs, changes in central nervous system and erythronormoblastic anaemia (decrease of haemoglobin in the blood) may occur as a result of chronic poisoning.

**4.3 Indication of any immediate medical attention and special treatment needed:**

A physician is responsible for making decisions concerning treatment methods after detailed examination of patient's state of health.

**SECTION 5. Firefighting measures**
**5.1 Extinguishing media:**

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Appropriate extinguishing media: non-flamable substance. In case of fire use fire-extinguishing media appropriate for surrounding materials.

Unsuitable extinguishing media: unknown

**5.2 Special hazards arising from the substance or mixture:**

In high temperature, sulphur dioxide and/or sulphur trioxide as well as copper oxides may be formed.

**5.3 Advice for fire-fighters:**

Depending on the burning material. In case of direct contact of the substance with fire use full protective clothing and self-contained breathing apparatus.

General recommendations: Inform others about the fire. Evacuate from the hazard location all people not involved in fire suppression. Inform the Smelter Senior Shift Supervisor.

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**SECTION 6: Accidental release measures**

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**6.1 Personal precautions, protective equipment and emergency procedures:**

Evacuate from the hazard location all people not involved in rescue operations. For personal protection, see section 8.

**6.2 Environmental precautions:**

In case of accident, do not release into the environment. Do not discharge into drains. Collect from the work area as soon as possible and place in proper containers for disposal. In case of releasing a large amount of material or environment contamination inform suitable authorities and emergency services.

**6.3 Methods and material for containment and cleaning up:**

Protect the work area to avoid dust generation. Eliminate any leakages (seal damaged container, place in protective container). Clean-up the substance into container and dispose as hazardous waste. In case of solutions collect spillage with absorbents (diatomaceous earth, sand or other absorbent which is not reactive with the substance) to a sealed container.

**6.4 Reference to other sections**

For personal protection measures, see section 8. For waste disposal see section 13.

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**SECTION 7. Handling and storage**

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**7.1 Precautions for safe handling:**

Avoid formation of aerosols in the work area. Use only small amounts of the substance in properly labelled room with working ventilation. Protective means for spillage clean-up should be available in the work area. Containers with the substance should be labelled properly. When not in use, store tightly closed. Containers may contain residues which are hazardous. Do not eat, drink and smoke when handling the substance. Wash hands before eating when handling the product. Do not swallow. Rooms must be equipped with property working extraction ventilation. The work area must be equipped with safety shower (for body wash) and separate shower for eyes rinsing.

**7.2 Conditions for safe storage, including any incompatibilities:**

Always store in tightly closed original container in a dry, cool and well-ventilated place equipped with electrical and ventilation system. Protect the container against damage. Only properly trained people should have access to suitably labelled container storing place.

**7.3 Specific end use(s):**

The identified uses for this product are detailed in Section 1.2.

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**SECTION 8. Exposure control/personal protection**

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**8.1 Control parameters:**Occupational exposure limit values to be followed:

Copper and cupric inorganic compounds – per Cu (TLV, TLV-STEL) – TLV: 0.2 mg/m<sup>3</sup>, TLV-STEL: not determined.

The derived no-effect levels (DNELs) for copper:

DNEL (skin, inhalation; prolonged exposure) – 0.041 mg/kg bw/day);

DNEL (oral, short-term exposure) – 0.082 mg/kg bw/day);

Predicted no effect concentrations (PNECs) for copper:

PNEC (Surface waters) – 7.8 µg/l

PNEC (Marine waters) – 5.2 µg/l

PNEC (Fresh waters deposits) – 87 mg/kg of dry mass

PNEC (Marine waters deposits) – 676 mg/kg of dry mass

PNEC (Soil) – 65.5 mg/kg of dry mass

Additional advice:

Regulation of the Minister of Labour and Social Policy dated 29 November 2002 concerning maximum admissible concentrations and intensities of agents harmful to human health in the work environment (Journal of Laws, Dz.U.02.217.1833 as amended);

Regulation of the Minister of Health dated 30 December 2004 concerning occupational health and safety on protection of workers from risk related to exposure to chemical agents at work. (Journal of Laws, Dz.U.05.11.86 as amended);

Determination in air at the workplace:

PN-91/Z-04030.05 Total dust concentration using filter weight method in the range of 0.05-80.00 mg/m<sup>3</sup>;

PN-91/Z-04030.06 Respirable dust concentration using filter weight method in the range of 0.05-80.00 mg/m<sup>3</sup>;

PN-Z-04008-7.2002. Air purity protection – Air sampling – Principles of air sampling at workplace and results interpretation;

PN-EN 689:2002 Air in the workplace – Guidelines on evaluation of inhalation exposure to chemicals by comparing with admissible values and measurement strategy;

PN-EN 482:2006 Air in the workplace – General requirements on measurement procedures;

PN ISO 4225/Ak:1999 Air quality – General issues – Terminology (national sheet).

**8.2 Exposure controls:**

Provide appropriate ventilation for production areas and workplaces. Avoid dust inhalation.

During copper processing, use personal protective equipment adequate for existing hazards considering national and European legislation.

Eye and face protection: Use safety goggles.

Hand protection: Necessary – use protective gloves preventing from direct contact with chemical substances.

Skin protection: Protective clothing.

Respiratory protection: Necessary in presence of dust – P-3 air-purifying dust mask.

Hygiene considerations: Change contaminated clothes immediately. Clean the contaminated clothes before reuse. Wash hands and face at the end of work with the substance. When using, do

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not eat and drink.

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**SECTION 9. Physical and chemical properties**

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**9.1 Information on basic physical and chemical properties:**

Appearance: blue solid, possible dark inclusions

Odour: odourless

Odour detection threshold: not applicable

pH: approx. 4 (50 g/l H<sub>2</sub>O, 20 °C)

Melting point: 110 °C

Boiling point: 150 °C

Flash point: not applicable

Auto ignition temperature: not applicable

Flash point: not applicable

Evaporation rate: not applicable

Flammability: not applicable

Explosive limits: not applicable

Vapour pressure: not applicable

Vapour density: not applicable

Relative density: 2.284 g/cm<sup>3</sup> (25 °C)Bulk density: approx. 1100 kg/m<sup>3</sup>

Solubility:

In water: 423 g/l (20 °C), 2 023 g/l (100 °C)

In inorganic solvents: low solubility in alcohols, good solubility in glycerine.

Octanol/water partition coefficient: not applicable

Auto ignition temperature: not applicable

Decomposition temperature: no data available

Viscosity: not applicable

Explosive properties: not applicable

Oxidising properties: not applicable

**9.2 Other information:**

None

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**SECTION 10. Stability and reactivity**

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**10.1. Reactivity:** low-reactive substance.**10.2. Chemical stability:** substance is stable under normal use and storage conditions.**10.3 Possibility of hazardous reactions:** no data available**10.4 Conditions to avoid:** heat sources (high temperature).**10.5 Incompatible materials:** strong acids, aluminium, acetylene, nitromethane, hydrazine. Reactive with hydroxylamine. Copper sulphate solutions are acidic and produce hydrogen in contact with magnesium.**10.6 Hazardous decomposition products:** Fire or heating may cause production of copper oxides and sulphur oxides.

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**SECTION 11. Toxicological information**

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**11.1 Information on toxicological effects:**

Acute Toxicity: harmful if swallowed.

Respiratory toxicity: based on available data, does not meet the criteria for classification.

Corrosive/irritating to skin: based on available data, does not meet the criteria for classification.

Serious eye damage/irritating to eyes: causes serious eye damage.

Allergic to skin and respiratory reaction: may cause an allergic skin reaction.

Germ cell mutagenicity: based on available data, does not meet the criteria for classification.

Carcinogenicity: may cause cancer.

Reproductive toxicity: may damage fertility or the unborn child.

Toxic effect on target organs-repeated exposure: causes damage to organs through prolonged or repeated exposure.

Aspiration hazard: based on available data, does not meet the criteria for classification.

**Lethal and toxic doses and concentrations:**

LDL<sub>0</sub> (p.o., human) 875 mg/kg

LD<sub>50</sub> (i.p., mouse) 18 mg/kg

LD<sub>50</sub> (p.o., rat) 300 mg/kg

LDL<sub>0</sub> (s.c., mouse) 500 mg/kg

LD<sub>50</sub> (s.c., rat) 43 mg/kg

LDL<sub>0</sub> (i.v., mouse) 50 mg/kg

LD<sub>50</sub> (unknown, rat) 630 mg/kg

LDL<sub>0</sub> (i.v., rabbit) 10 mg/kg

**Lowest published lethal dose (LDL<sub>0</sub>) for human orally 50-857 mg/kg of bodyweight.**

**Lowest published toxic dose (TDL<sub>0</sub>) for human orally 11-150 mg/kg of bodyweight. Kidneys damage and blood dyscrasia have been found.**

**11.2. Information on likely routes of exposure:**

Entry routes: respiratory, ingestion, skin.

Due to slow respiratory and ingestive absorption and low skin absorption only high doses cause acute poisonings. Prolonged absorption causes peripheral muscles weakness, anaemia and central nervous system disorders. Accumulation in: bones, kidneys and other tissues.

**11.3. Delayed and immediate effects as well as chronic effects from short and long-term exposure:**

Detailed information concerning symptoms related to product properties and possible effects of exposure have been described in section 4.2.

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**SECTION 12. Ecological information**

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**12.1. Toxicity:**

Acute toxicity (LC<sub>50</sub>/96h) fish ≤ 1 mg/l – very toxic to aquatic organisms.

IC<sub>50</sub>/72h (medium inhibitory concentration) alga < 1 mg/l

Very toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

Do not release to waters, soil and sewerage system.

Fungicidal.

Toxic concentrations of cupric compounds in aquatic environment:

Limit values for surface water quality indicators:

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Copper: 0.05 mg/l indicator from the group of substances highly harmful for aquatic life which refers to good and higher than good ecological condition of uniform surface waters.

Sulphates:Purity class I - < 150 mg SO<sub>4</sub><sup>2-</sup>/l; pH = 6.0 ÷ 8.5;Purity class II - 250 mg SO<sub>4</sub><sup>2-</sup>/l; pH = 6.0 ÷ 9.5;Permissible contamination of sewage released into waters and soil:Cu - 0.5 mg/l, SO<sub>4</sub><sup>2-</sup>/l - 500 mg/lThreshold toxic concentration (CuSO<sub>4</sub> \* H<sub>2</sub>O) fish:*Cyprinus carpio* LC<sub>50</sub> (96h) - 0.81 mg/l,*Pimephales promelas* LC<sub>50</sub> (96h) - 0.45 mg/l,Threshold toxic concentration for:crustaceans - *Daphnia magna* LC<sub>50</sub> (48h) - 0.0098 mg/l,algae - *Pseudokirchneriella subcapitata* EC<sub>10</sub> (72h) - 0.108 mg/l.

**12.2. Persistence and degradability:** Not biodegradable in soil or water; may cause contamination of surface and ground waters.

**12.3. Bioaccumulative potential:** Copper sulphate coefficient determined through tests is higher than 100 showing significant bioaccumulation properties.

**12.4. Mobility in soil:** Low mobility in soil and aquatic environment.

**12.5. Results of PBT and vPvB assessment:** Not applicable - inorganic substance.

**12.6. Other adverse effects:** No data available.

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**SECTION 13: Disposal considerations**

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**13.1. Waste treatment methods**

Do not empty to sewerage system. Prevent from contamination of surface and ground waters. Do not dispose together with municipal waste. Method of disposal should be discussed with local Environmental Protection Department.

Classification of wastes:

- Waste Catalogue (Journal of Laws, Dz. U.01.112.1206): 06 04 05 Wastes containing other heavy metals;
- OECD Green List of Wastes: GA 120 Copper wastes and scrap
- OECD Amber List of Wastes: AA 040 Copper ashes and residues

Legal basis:

Waste Act dated 27.04.2001 (Journal of Laws, Dz. U.2010.185.1243 and Journal of Laws, Dz.U.2010.203.1351 as amended). Act dated 11.05.2001 relating to packing and waste packages (Journal of Laws, Dz. U. No. 63, item 638 as amended). Regulation of the Minister of Environment dated 27.09.2001 in the matter of packages catalogue (Journal of Laws, Dz. U. No. 112, item 1206 as amended). Regulation of the Minister of Economy dated 25 October 2005 on the detailed method for dealing with packaging waste (Journal of Laws, Dz. U. No. 219, item 1858 as amended).

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**SECTION 14: Transport information**

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General transport regulations should be used. Covered transport is recommended.

**14.1. UN number:** UN 3077

**14.2. UN proper shipping name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.

**14.3. Transport hazard class(es):** 9 / M7



**14.4. Packing group:** III**14.5. Environmental hazards:** 90**14.6. Special precautions for user:** Secure packages against moving while shipping**14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code:** n/a

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**SECTION 15: Regulatory information**

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

Not regulated under the criteria set in Regulation (EC) No. 2037/2000 of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer (Journal of Laws, Dz.U. L 244 from 29.9.2000 as amended) and Regulation (EC) No. 850/2004 of the European Parliament and of the Council of 29 April 2004 on persistent organic pollutants and amending Directive 79/117/EEC (Journal of Laws, Dz.U. L 158 of 30.4.2004 as amended).

The substance is not subject to the criteria set in Regulation (EC) No. 689/2008 of the European Parliament and of the Council of 17 June 2008 concerning the export and import of dangerous chemicals (Journal of Laws, Dz.U. L 204 of 31.7.2008 as amended).

Cupric compounds are not listed in annex X Decision No. 2455/2001 of the European Parliament and of the Council of 20 November 2001 establishing the list of priority substances in the field of water policy and amending Directive 2000/60/EC (Journal of Laws, Dz.U. L 331, 15/12/2001).

**Provisions of law:**

Regulation (EC) No. 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the registration, evaluation, authorisation and restriction of chemicals (REACH), establishing the 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, including amendments; Environmental Protection Law dated 27 April 2001 (Journal of Laws, Dz.U.01.62.627 as amended); Act dated 25 February 2011 on the chemical substances and their mixtures (Journal of Laws, Dz. U. 2011.63.322 as amended); Act dated 14 December 2012 on wastes (Journal of Laws, Dz. U.2013.0.21 as amended); Regulation of the Minister of Environment dated on 27 September 2001 in the matter of packages catalogue (Journal of Laws, Dz.U.01.112.1206 as amended); Act dated 11 May 2001 relating to packing and waste packages (Journal of Laws, Dz.U.01.63.638 as amended); Act dated 19 August 2011 on transportation of hazardous substances (Journal of Laws, Dz.U.2011.227.1367 as amended ); Regulation of the Minister for Economy dated 21 December 2005 in the matter of basic requirements for individual protection means (Journal of Laws, Dz.U.2005.259.2173 as amended); Regulation of the Minister of Health dated 2 February 2011 in the matter of tests and measurements on agents harmful for human health in work environment (Journal of Laws, Dz.U.11.166.2526 as amended); Regulation of the Minister of Economy dated 29 January 2013 in the matter of limitations in production, trade or use of hazardous or potentially dangerous substances and mixtures and placing on a market or putting into use products containing such substances and mixtures (Journal of Laws, Dz. U. of 2013 r. item 180 as amended); Regulation of the Minister of Environment dated 28 January 2009 amending the regulation on conditions to be fulfilled at the discharge of effluents to water or soil and on substances posing particular threat to aquatic environment (Journal of Laws, Dz. U. 2009.27.169 as amended).

**15.2. Chemical safety assessment**

A chemical safety assessment has been carried out. Chemical Safety Report for copper sulphate is available at: KGHM Polska Miedź S.A. „Legnica” Copper Smelter & Refinery.

**SECTION 16: Other information**

Full version of Hazards Statements and Risk Phrases provided in sections 2 - 15:

R38 - Irritating to skin;

H302 - Harmful if swallowed

H315 - Causes skin irritation;

H319 - Causes serious eye irritation;

H341 - Suspected of causing genetic defects; H332 - Harmful if inhaled;

H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled;

H350i - May cause cancer;

Explanations of abbreviations and acronyms used in the MSDS:

**CAS Number** - numerical identifier assigned by the Chemical Abstracts Service (CAS) to every chemical substance which allows for its further identification.

**EC Number** - identifier assigned to chemical substances in EINECS - European Inventory of Existing Chemical Substances or identifier assigned to chemical substances in ELINCS - European List of Notified Chemical Substances), or identifier in the index of chemical substances published in "No-longer polymers" list.

**Index Number** - identification code stated in annex VI, part 3 of Regulation (EC) No. 1272/2008 on classification, labelling and packaging of substances and mixtures.

**Registration Number** - issued by the European Chemicals Agency (ECHA) after registration of the substance/component by the producer/importer in accordance with REACH Regulations.

**LD<sub>50</sub>** - toxic substance dose expressed in the units of mg/kg body weight needed to kill 50% of the of test subjects exposed.

**LC<sub>50</sub>** - substance concentration in the air expressed in the units of mg/l that will kill 50% of the test subjects exposed over a specified time of inhalation.

**EC<sub>50</sub>** - substance dose expressed in the units of mg/l causing a given pharmacological effect (e.g. growth inhibition) among 50% of the test subjects exposed over a specified time.

**NOEC** - highest concentration of a toxic substance which presents no adverse effect when used.

**TLV** - threshold limit value - level of a chemical substance to which a worker can be exposed on the basis of a 8h per day, 40h per week work schedule described in Labour Code for a working lifetime without adverse health effects on this worker and his/her progeny.

**TLV-STEL** - short-term exposure limit - average concentration level which should not cause any adverse effects on health if the exposure in the work environment is equal to or less than 15 minutes and occurs twice per shift in minimal time intervals of 1 hour.

**DNEL** - derived level with no effect on organisms.

**PNEC** - predicted concentration with no effect on environment.

Necessary trainings: on-site training related to safe using of substances with hazardous properties for human and adverse effects on environment.

Sources of information used to compile this material safety data sheet:

- Self-results of refined lead quantitative and qualitative analysis;
- Dangerous Substances Practical Handbook ALFA-WEKA
- European Chemical Substance Information System;
- Technology Encyclopedia CHEMISTRY. WNT;

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- CHEMISTRY structure and reactions. Milton K.Snyder;
- Chemical Safety Report.

All information contained herein is accurate and up-to-date to the best of our knowledge. Recipients of our products should consider existing provisions of law and other applicable regulations.

This material safety data sheet is the property of KGHM Polska Miedź S.A. "Legnica" Copper Smelter & Refinery and features only our product.

Further information: telephone contact at numbers provided in point 1.

Modifications to this document:

- Product identifier in point 1.1
- Discouraged uses in point 1.2

Compiled and revised by: M.Sc. Hubert Opaczewski - Deputy Chief Process Safety Officer

DYREKTOR  
DS. TECHNICZNYCH I PRODUKCJI  
*Leszek Garycki*

