

**Refined lead with increased content of bismuth**

Date of issue: 20.11.2008

Revision No. / Revision date: 4 / 29.05.2014

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

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**1.1 Product identifier:****Trade name:** refined lead with increased content of bismuth**UN No.:** not assigned**1.2 Relevant identified uses of the substance or mixture and uses advised against**Identified uses: for production of: alloys, metal sheets, pipes, grapeshots, glass, electric cables coatings, ionizing radiation protection.Uses advised against: not known**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:**Head of Lead Electrorefining Department:** (48 76) 747 53 51 – available: Mon. – Fri. 7<sup>15</sup> – 15<sup>15</sup>,**Head of Customer Service Section and Finished Products Warehouse** (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 preparing the MSDS: phone No.: (+48 76) 747 22 45,

e-mail: [karty.charakterystyki@kghm.pl](mailto:karty.charakterystyki@kghm.pl)**1.4. Emergency telephone number**

Manufacturer (Poland): (48 76) 747 50 02 – available 24/7

112 (General Emergency), 998 (Fire Dept.), 999 (Ambulance Service)

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**SECTION 2. Hazards identification**

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**2.1. Classification of the substance or mixture:**Classification according to Regulation No. 1272/2008 (CLP):

Not classified

Classification according to Directive 67/548/EWG:

Not classified

**2.2. Label elements:**

None

**2.3 Other hazards:**

Although lead in its metallic form, in accordance with current regulations, is not classified as hazardous there is a danger of poisoning when lead is processed or processing products are used. Lead compounds are hazardous through inhalation and when swallowed. May cause long-term adverse effects in the aquatic environment and damage fertility or the unborn child.

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

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**3.1. Substances**

n/a

**3.2. Mixtures**

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Ordinal No.	Substance name	CAS No.	WE No.	Index No.	Percentage content [mass fraction]	Symbols	H statements	REACH registration No.
1.	Pb	7439-92-1	231-100-4	not assigned	over 85	n/a	none	01-2119439361-44-0003
2.	Bi	7440-69-9	231-177-4	not assigned	up to 15	n/a	none	05-2115491990-35-0000

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

Refined lead with increased content of bismuth in a form of sows, if it is not subject to high temperature or chemical agents, does not present chemical danger to health and life. Because of a significant load of packets there is a great danger during transportation; therefore, relevant transport regulations should be observed.

This section considers all possible hazards caused by lead-containing materials and related to production and processing of lead with increased content of bismuth.

Inhalation: In case of exposure to fumes and dust: remove victim immediately to fresh air, provide rest in a lying position, get medical attention.

Ingestion: Give plenty of lukewarm water and induce vomiting. Get medical attention.

Eye contact: Promptly wash wide open eyes with plenty of lukewarm water for 15 minutes. Avoid using pressure water due to risk of eye damage. Get medical attention.

Skin contact: After contact with the substance use general hygiene measures: wash the skin immediately with cold water and soap. In case of contact with liquid product cool skin immediately with water and get medical attention. Do not remove melted material from skin to avoid skin damage. Cut wounds or sores should be disinfected immediately.

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

Not applicable.

Refined lead with increased content of bismuth in a form of sows, if it is not subject to high temperature or chemical agents, does not present chemical danger to health and life; however, the presence of lead dust causes danger during production and processing of lead. This section considers possible hazards caused by lead-containing materials and related to production and processing of lead.

Symptoms of acute lead poisoning: acute poisoning symptoms may occur after exposure to highly concentrated dust or fumes lasting several days or in case of chronic exposure to lead in concentration exceeding limit values. Possibility of increased blood pressure and abdominal pain (colic) usually preceded by constipation lasting for several days. Ingested lead (accidentally or purposely) in a form of powder causes similar symptoms and sometimes results in jaundice or liver damage. Poisoning may also result in kidneys damage (usually short-lasting) and erythronormoblastic anaemia (decrease of haemoglobin and increase of reticulocytes in the blood).

Symptoms of chronic lead poisoning: chronic absorption causes peripheral muscles weakness, changes in peripheral nerves (mainly in limbs), anaemia, central nervous system disorders and erythronormoblastic anaemia.

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

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

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**SECTION 5. Firefighting measures**

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**5.1 Extinguishing media:**

Appropriate extinguishing media: Product in a form of sows is a non-flammable material. In case of fire, use fire-extinguishing media appropriate for surrounding materials. General fire safety regulations apply.

Unsuitable extinguishing media Do not pour water on molten metal.

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

In case lead is subject to high temperature, harmful fumes may be formed.

**5.3 Advice for fire-fighters:**

All personnel involved in firefighting proceedings and removals of the substance should use full protective clothing, self-contained breathing apparatus and a full facepiece mask.

General advice: The substance is non-flammable. Use extinguishing means appropriate for the source of fire.

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**SECTION 6: Accidental release measures**

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

Do not inhale the dust if there is a risk of their occurrence.

Personnel involved in the rescue operations should wear protective clothing and self-contained breathing apparatus. Use personal protection as described in section 8.

**6.2 Environmental precautions:**

Avoid release into the environment.

In case of releasing the material to surface waters or soil, remove it immediately.

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

Not applicable for refined lead with increased content of bismuth in a form of ingots.

**6.4 Reference to other sections**

For personal protection equipment, 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:**

All rooms should be equipped with appropriate ventilation. Do not eat, drink and smoke when handling the substance. The product is non-flammable.

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

Indoor transport using a forklift truck or gantry crane. Do not exceed the permissible unit loads in the storage area. Do not store with acids or bases and materials described in section 10.5. Do not store with food and inflammable materials.

**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:

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Lead and lead inorganic compounds – per Pb (TLV, TLV-STEL) – TLV: 0.5 mg/m<sup>3</sup>, TLV-STEL: not determined.

Derived No-Effect Levels for lead:

DNEL (long-term exposure) – 40 µg Pb/dL of blood (workers – men);

DNEL (long-term exposure) – 30 µg Pb/dL of blood (workers – women);

DNEL (long-term exposure) – 10 µg Pb/dL of blood (workers – pregnant women);

DNEL (long-term exposure) – 20 µg Pb/dL of blood (general population);

DNEL (long-term exposure) – 10 µg Pb/dL of blood (general population – pregnant women);

Predicted No-Effect Concentrations for lead:

PNEC (fresh water) – 6.5 µg/l

PNEC (marine water) – 3.4 µg/l

PNEC (fresh water sediment) – 174mg/kg of dry mass

PNEC (marine water sediment) – 164.2 mg/kg of dry mass

PNEC (soil) – 147 mg/kg of dry mass

PNEC (STP) – 0.1 mg/l

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 (Official Journal No. 217, item 1833 with subsequent amendments);

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. (Official Journal No. 11, item 86 with subsequent amendments);

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 – Procedures for air sampling in the workplace and results interpretation;

PN-EN 689:2002 Air at occupational place – requirements concerning evaluation of inhalation exposure to chemical agents by comparison with admissible concentrations and measurement strategy;

PN-EN 482:2006 Air at occupational place – General requirements on measurement procedures; PN ISO 4225/Ak:1999 Air quality – General issues – Terminology (national paper).

**8.2 Exposure controls:**

In case of exposure to lead and lead inorganic compounds at workplace, undertake all technical and organizational measures to decrease the level of lead. During processing of lead provide local exhaust ventilation with housing in case of dust emission to air as well as general ventilation of the room.

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

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and should preferably be treated in an on-site waste water treatment plant which ensures efficient removal of lead.

Workers should have a possibility to comply with basic principles of hygiene. In the area where lead is used and stored eating, drinking and smoking should be forbidden. Employees should wash hands and face before eating, drinking and smoking. Wash hands (whole body if necessary) at the end of work with the substance. Clean the contaminated clothing before reuse.

As part of personnel health control, it is necessary to implement biomonitoring programme which includes blood lead level control (PbB) using atomic absorption spectrometry or any equivalent method. A permissible lead level in biological material is 50 ng Pb/100 ml of blood. In case the permissible level is exceeded suitable measures should be taken to hinder the increase of lead level in blood (no overtimes, control of compliance with principles of hygiene and procedures for the use of personal protection equipment, delegation of an employee to another workplace away from the source of lead).

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

Eye and face protection: not needed, in case of exposure to dust use safety goggles. Do not use contact lenses.

Hand protection: protective gloves (recommended materials: leather, neoprene).

Skin protection: protective clothing.

Respiratory protection: when dust is formed use dust half-mask equipped with filter suitable for determined air concentration.

Hygiene considerations: change contaminated clothes immediately. Clean the contaminated clothing before reuse. Wash hands and face at the end of work with the substance. Do not eat and drink during handling the substance.

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**SECTION 9. Physical and chemical properties**

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

Appearance: silver-grey solid

Odour: odourless

Odour threshold: not applicable

pH: not applicable

Melting point: 326 °C

Initial boiling point: 1749 °C

Flash point: not applicable

Auto ignition temperature: not applicable

Evaporation rate: not applicable

Flammability: not applicable

Explosive limits: not applicable

Vapour pressure: not applicable

Vapour density: not applicable

Density: approx. 11340kg/m<sup>3</sup> (20 °C)

Solubility:

- in water: (20 °C): insoluble
- in acids: (20 °C): depending on acid type and concentration

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- in basis: (20 °C): insoluble
- in organic solvents: (20 °C): no data

Octanol/water partition coefficient: 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:** refined lead is stable under normal use conditions and if not exposed to chemical agents.**10.3 Possibility of hazardous reactions:** none under normal use conditions**10.4 Conditions to avoid:** high temperature, contact with incompatible materials.**10.5 Incompatible materials:** fluorine, nitric acid, azides, picrates, strong oxidants.**10.6 Hazardous decomposition products:** none

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**SECTION 11. Toxicological information**

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**11.1 Information on toxicological effects:**Acute toxicity (oral):

On the basis of available data the classification criteria are not met.

Acute toxicity (inhalation):

On the basis of available data the classification criteria are not met.

Skin corrosion/irritation:

On the basis of available data the classification criteria are not met.

Serious eye damage/ eye irritating:

On the basis of available data the classification criteria are not met.

Respiratory tract or skin sensitization:

On the basis of available data the classification criteria are not met.

Germ cell mutagenicity:

On the basis of available data the classification criteria are not met.

Carcinogenicity:

On the basis of available data the classification criteria are not met.

Reproductive toxicity:

On the basis of available data the classification criteria are not met.

STOT-single exposure/ STOT-repeated exposure:

On the basis of available data the classification criteria are not met.

Aspiration hazard:

On the basis of available data the classification criteria are not met.

Lethal and toxic doses and concentrations:**Lead:** no quantitative data available for lead in metallic form**Lead(II) oxide:**

**Refined lead with increased content of bismuth****Date of issue: 20.11.2008****Revision No. / Revision date: 4 / 29.05.2014**LD<sub>50</sub> (rat, oral) > 2000 mg/kg body massLD<sub>50</sub> (rat, inhalation) > 5mg/l/4hLD<sub>50</sub> (unknown, rat) > 2000 mg/kg body mass**11.2. Information on likely routes of exposure:**Routes of exposure: respiratory system, digestive tract, skin.

Due to slow respiratory and ingestive absorption and low skin absorption only very high doses cause acute poisonings. Long-term 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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Product in a form of sows is not a source of ecological hazard.

Physical or chemical processing of lead may become a source of ecological hazard.

**12.1. Toxicity:**

According to data presented in the Chemical Safety Report, refined lead in a form of sows is not classified as toxic to aquatic environment mainly due to its low solubility. Inorganic lead compounds are considered as highly toxic for environment and may present a hazard to aquatic life. Solution toxicity depends on free lead ions level.

Threshold limit value for substance in air: is 0.5 µg/m<sup>3</sup> averaged per calendar year.

Permissible contamination of sewage released into water and soil: for heating industry, 0.1 mg/dm<sup>3</sup> for other types of sewage 0.5 mg/dm<sup>3</sup>.

Predicted No Effect Concentration of lead:

PNEC (STP) – 0,1 mg/l

PNEC (birds, oral exposure) – 16.9 mg/kg of food

PNEC (mammals, oral exposure) – 10.9 mg/kg food

Lethal/effect concentrations of lead in aquatic environment:

LC<sub>50</sub>/96 h fish (*Pimephales promelas*): 40.79 µg Pb/lLC<sub>50</sub>/96 h fish (*Salmo gairderi*): 107 µg Pb/lLC<sub>50</sub>/48 h crustaceans (*Ceriodaphnia dubia*): 26.4 µg Pb/lLC<sub>50</sub>/48 h crustaceans (*Daphnia magna*): 107.03 µg Pb/lEC<sub>50</sub> / 48h crustaceans (*Daphnia magna*): 107.5 µg/lNOEC crustaceans (*Daphnia magna*): 9.0 µg/lLC<sub>50</sub>/24h algae, growth inhibition (*Pseudokirchneriella subcapitata*): 21.7 µg Pb/l.EC<sub>50</sub> / 72h algae (*Pseudokirchneriella subcapitata*): 52 µg/lNOEC algae (*Pseudokirchneriella subcapitata*): 11.9 µg/l

Lethal dose for fish per Pb from 1.4 mg/l.

**12.2. Persistence and degradability:** Not biodegradable.**12.3. Bioaccumulative potential:** Risk of accumulation in organisms.**12.4. Mobility in soil:** Low mobility in soil and aquatic environment.**12.5. Results of PBT and vPvB assessment:** Not applicable to inorganic substances.**12.6. Other adverse effects:** No data.



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**SECTION 13: Disposal considerations**

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**13.1. Waste treatment methods**

Lead wastes and scrap should be recycled or disposed as hazardous wastes.

Prevent from contamination of fresh and ground waters and soil. Do not dispose together with municipal waste.

Classification of wastes:

Waste Catalogue (Journal of Laws, Dz. U.O1. 112.1206):

- 17 04 03 Lead
- 06 04 05\* Wastes containing other heavy metals

OECD Green List of Wastes:

- GA 150 Lead wastes and scrap

OECD Amber List of Wastes:

- AA 030 Lead ash and residues

Legal basis: Act of April 27th 2001 on waste (Official Journal No. 185, item 1243 and Official Journal No. 203, item 1351 with subsequent amendments).

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**SECTION 14: Transport information**

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General transport regulations apply. Covered transport is recommended.

**14.1. UN 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:** 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**

The substance is 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 (Official Journal No. 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 (Official Journal No. 158 of 30.4.2004 with subsequent amendments).

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 (Official Journal No. 204 of 31.7.2008 with subsequent amendments).

Lead 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 (Official Journal No. 331 of 15.12.2001).

Provisions of law:

Regulation (EC) No. 1907/2006 of the European Parliament and of the Council of 18 December 2006



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concerning the registration, evaluation, authorization 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; Regulation No 1272/2008 dated 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/ EC and 1999/45/ EC and amending Regulation (EC) No 1907/2006 (Official Journal No.353/1 as amended). Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on registration, evaluation, authorization and restriction of chemicals (Official Journal No. 133/1 dated 31.05.2010). Environmental Protection Law dated 27 April 2001 (Official Journal No. 01.62.627 with subsequent amendments); Act dated 27 April 2001 on wastes (Official Journal No. 2010.185.1243 and 2010.203.1351 as amended); Regulation of the Minister of Environment dated on 27 September 2001 in the matter of packages catalogue (Official Journal No. 01.112.1206 with subsequent amendments); Act dated 11 May 2001 relating to packing and waste packages (Official Journal No. 01.63.638 with subsequent amendments); 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 (Official Journal No. 02.217.1833 with subsequent amendments); Regulation of the Council of Ministers of 24 August 2004 concerning the list of work forbidden to juveniles and conditions of engaging them to do some jobs (Official Journal No. 04.200.2047 with subsequent amendments); Act dated 28 October 2002 on road transport of hazardous goods (Official Journal No. 02.199.1671 with subsequent amendments); Act dated 31 March 2004 on rail transport of hazardous goods (Official Journal No. 04.97.962); Regulation of the Minister for Economy dated 21 December 2005 in the matter of basic requirements for individual protection means (Official Journal No. 2005.259.2173 with subsequent amendments); Regulation of the Minister of Health dated 20 April 2005 on studies and tests concerning occupational health hazards (Official Journal No. 2005.73.645); Regulation of the Minister of Environment dated 20 August 2008 on the method of classifying the condition of uniform parts of surface waters (Official Journal No. 2008.162.1008); 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 (Official Journal No. 2009.27.169 with subsequent amendments); Act dated 25 February 2011 on the chemical substances and their mixtures (Official Journal No. 2011.63.322).

**15.2. Chemical safety assessment**

Chemical safety assessment of the substance has been carried out. Chemical Safety Report for lead is available at KGHM Polska Miedź S.A. „Legnica” Copper Smelter & Refinery.

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**SECTION 16: Other information**

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Explanation of abbreviations and acronyms used in this material safety data sheet:

**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

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"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 Chemistry Committee.

**IUPAC name** – name of a substance given by IUPAC - *International Union of Pure and Applied Chemistry Committee*.

**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.

**LD<sub>50</sub>** – 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<sub>50</sub>** – 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<sub>50</sub>** – effect concentration - substance concentration expressed in milligrams per litre causing the given pharmacological effect (e.g. inhibition of growth) at 50% 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.

**DNEL** – derived no-effect level (DNEL) is the level of exposure to a substance above which humans should not be exposed.

**PNEC** – predicted no-effect concentration is the concentration of a chemical which has no predicted effect on the 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;
- Hazard substances. Practical Guide, ALFA-WEKA;
- European Chemical Substance Information System;
- Technical Encyclopaedia, CHEMIA, WNT;
- The structure and reactions; Milton K. Snyder, CHEMIA, WNT;
- Chemical Safety Report for lead.

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

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

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

Modifications to this document in accordance with Regulation (EC) No 453/2010 of 20 May 2010 in the scope of:

- Identification of the substance
- Classification and labelling of the substance
- First aid measures
- Fighting and accidental release measures
- Handling and storage
- Exposure controls and personal protection
- Physical and chemical properties
- Stability and reactivity
- Toxicological information
- Ecological information
- Disposal considerations
- Transport information
- Regulatory information
- Other information in section 16

Revised by: Process Safety Deputy Head Specialist, Hubert Opaczewski M.Sc. Eng.