CHEMICAL SAFETY REPORT

Substance Name: A1/ Copper/ European Copper Institute/2013

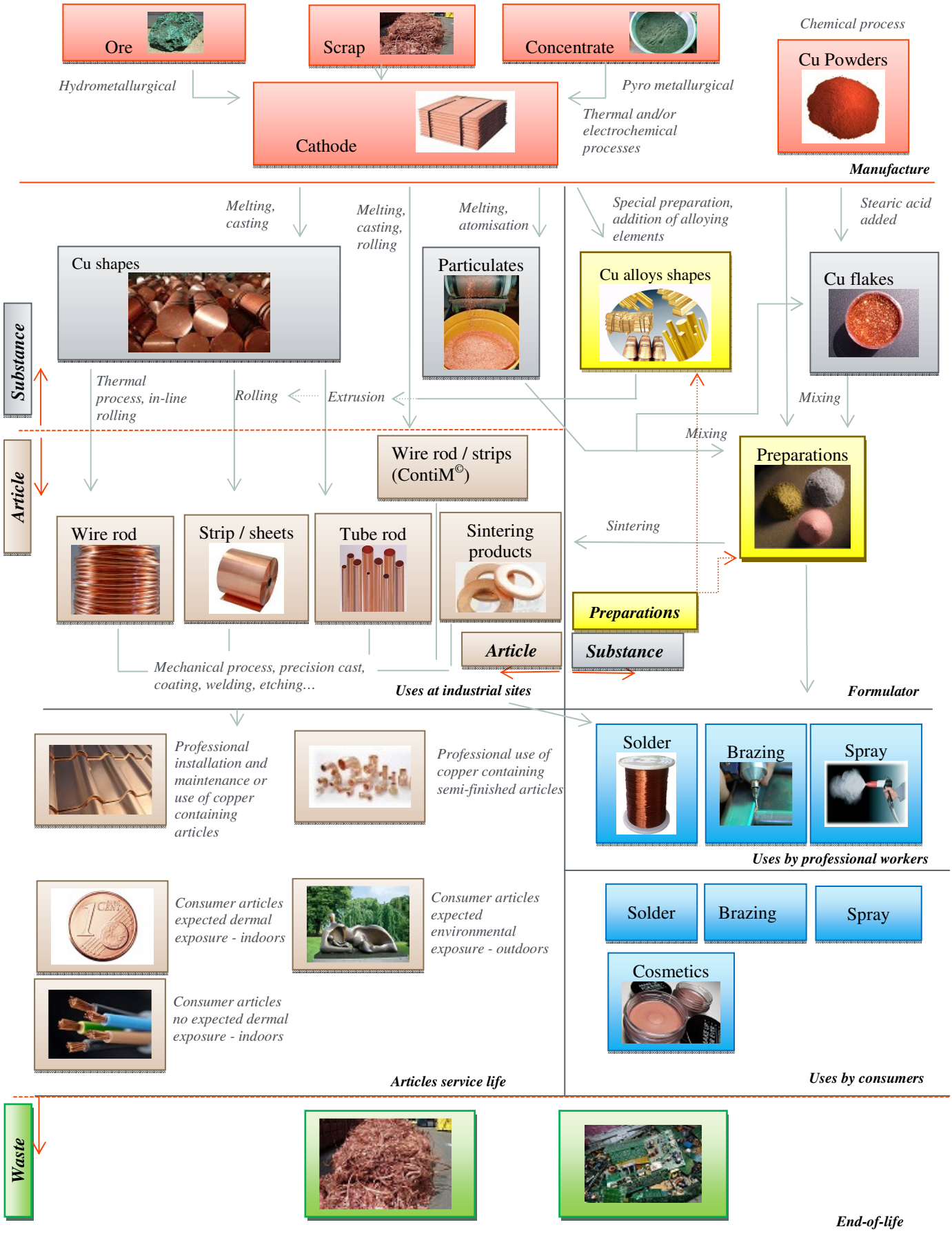
EC Number:

Registrant's Identity: European Copper Institute

Version 18: 30/Sep/2014

Life cycle tree

Exemplified supply chain of copper metal and copper powder



LIFE CYCLE TREE	
Identified use	**Brief description of use process**
Manufacture	
M-1: Production of copper massive (cathode):	**Manufacturing process Production of copper massive: Hydrometallurgical route** The primary and secondary hydrometallurgical copper production route involves the crushing of the ore followed by leaching using: -sulphuric acid, sometimes in the presence of biological species, using heap, vat or agitation -processes. The liquor produced from leaching is then clarified and purified and concentrated by solvent extraction. A further variation of leaching is possible where black copper is produced from in an Ausmelt/ISA Smelt furnace. The black copper granules are dissolved in an autoclave and the pure copper is electro-won from the resulting solution. The copper is then removed by electro-winning. The electrowinning process differs from the electrorefining process in the form of the anode. Electrowinning uses an inert anode such as lead titanium and the metal ions are removed from the solution and deposited on the cathode in the same manner as electro-refining. Cathodes are then stripped in the same way if permanent cathode blanks are used. The electrolyte is circulated through a series of cells and finally is depleted of copper. Electrolyte is then returned to the solvent extraction circuit. Some electrolyte is normally bled for the control of impurities, which might have been carried over during solvent extraction **Manufacturing process Production of copper massive: Pyro metallurgical production route** The production of primary copper starts with the mining of copper ore. In the next step, concentrates are produced at the mining site by crushing, grinding, flotation, filtering and drying ores. Concentrates contain besides copper –as Cu2S- various other substances and during the production process, these are separated in a stepwise process, thus increasing the copper content of the remaining material. The process consists of the following steps: *Step 1: roasting and smelting of concentrate in a furnace to blister (98% Cu) and further into anodes (99.6% Cu).* The concentrate is converted to blister copper in two sub-steps. Both sub-steps are usually performed on the same site. First, copper is concentrated by partial oxidation of the concentrate at around 1250 ºC (smelting). The aim of this step is the removal of Fe and other impurities. Streams of concentrate and product are usually a liquid at this temperature. FeS is partially converted to FeO and SO2. CuS is converted to Cu2S and SO2. The SO2 is carried off in the exhaust gases. A Cu2S rich phase (the matte) does not mix with the remaining phase (FeO/ SiO2 phase), being tapped off as slag. In the second step, the matte produced is further oxidised in a second pyrometallurgical step (conversion) in a converter at 1250 ºC to metallic Cu, FeO and SO2. The conversion takes place in two stages. In the first stage the remaining FeS is oxidised to FeO/Fe3O4, which after mixing with SiO2 is again separated as slag. In the second stage Cu2S is converted into raw metallic copper (blister) and SO2. A small fraction of the copper present in the concentrate comes through to the slag from the smelter or the converter or appears as fly-ash in the waste gases from both processes. If there is a sufficiently high concentration of copper in the slag it is trapped and recirculated to the smelter, thereby increasing the yield of the process.

	Step 2: electro-refining of the anode copper into cathode copper of 99,9 % pure copper. During this step, the copper is purified further by electrolysis in a sulphuric acid solution to a purity of > 99.9%; it is made into cathodes in the electrolysis cell. Secondary copper is produced through the same process but using scrap as feed material.
M-2: Production of copper powder	*Chemical reduction:* a) Copper powder is oxidised under air at elevated temperature. Then it is partially or completely reduced using hydrogen at elevated temperature. The resultant powder is formed into high density solid pellets or particular shapes and sizes. b) Cuprous oxide is mixed with iron powder and then reduced using hydrogen gas at elevated temperature to form copper that is attached on the surface on of the iron powder *Chemical reduction (precipitation):* Copper sulphate is dissolved in water and reduced so that fine copper particles are precipitated. The powder is washed and dried. *Electrolytic deposition:* It consists of depositing metal on cathode plate by conventional electrolysis processes. The Cathode plates are removed and the deposited powder is scraped off. The powder is washed, dried, screened & oversized particles are milled or ground for fineness. The powder is in some cases further subjected to heat treatment to remove the work hardening effect.
Formulation	
F-1: Production of coated copper flakes	Copper grit is treated in a ball mill to form the coated copper flakes. During ball milling a process aid, such as zinc stearate or alternatively stearic acid, is added to avoid agglomeration of the formed flakes. It includes the following: -Copper flake powder production - ball milling -Particulate, powder handling, mixing blending and weighing
F-2: Production of copper powder / coated copper flake containing preparations	This use includes the following -Production of copper-powder coated copper flake containing preparations (eg brazing paste, pigment pastes, paints, coatings, sinter mixtures, lubricants, etc) -Particulate, powder handling, mixing blending and weighing -Particulates forming, tableting reduction and stabilisation -Use of particulates in liquids
F-3: Production of copper alloy shapes, and ingots or melts	This use includes the following -Production of ingots and unwrought shapes (e.g. billets, slabs and cakes) from alloys, in which copper is the main constituent, as well as where it is minor alloying element (eg in stainless steel,) by melting and casting -Low energy mechanical processing of cold metals -High energy work up of metals -Melting and casting

	-Surface treatment
Uses at industrial sites	
IW-1: Use of copper and copper alloy shapes for the production of shapes, ingots and /or copper containing articles.	This use includes the following -Production of copper fire-refined ingots unwrought shapes (billets, slabs and cakes, etc) – by melting and casting copper -Changing the microstructure of metals by batch or continuous heating in a controlled atmosphere to improve physical properties for a) fabrication of semis and b) fabrication of end user products -Use of copper and copper containing alloy for the production of castings (eg fittings faucets technical components, by meting and casting (sand casting, permanent casting mould casting lost from casting , precision casting)
IW-2 Use of copper/ copper containing alloys as intermediate for production of other copper containing substances	Use of copper/ copper containing alloys as intermediate for production of other copper containing substances
IW-3: Use of copper /copper containing alloys for the fabrication of copper containing articles by mechanical processes (such as rolling, extrusion)	This use includes the following -Production of copper (primary and secondary) and copper alloy containing articles (finished and semi-finished products - e.g. wires, bars, sections, tubes, strip/sheet, cables, wire profiles) –by extrusion and/or mechanical treatments. - Machining: all processes in which a work piece is modified by removing unwanted material in the form of turnings with the aim to obtain the desired shape. This includes: turning, drilling, countersinking, reaming, planning, shaping, broaching, sawing, filing, rasping and grinding, cold forming, mechanical polishing (mechanical abrasion),swaging. -Surface treatments (Mechanical milling to remove oxide layers, Pickling, Chemical treatment or blasting of internal tube surfaces, Cleaning and stain removal. Polishing. Pre-patination) -Etching -Welding -Production of friction materials by mechanical processes
IW-4: Use of copper/ copper containing alloys for the fabrication of wire rod	Production of copper /copper alloyed wire rod -Production of wire rod by immersion of seed rod in molten metal
IW-5: Use of copper/ copper containing alloys for the production of copper particulates and powders	This use includes the following -Production of copper particulates and powders (including catalyst pellets) – eg by thermal processing (melting, atomisation) of massive copper -Atomisation & Spray-Forming -Particulate, powder handling, mixing blending and weighing
IW-6: Use of copper/ copper containing alloys powder in metallic paints, coatings lubricants plastics, as a catalyst or uses that result in articles	This use includes the following -Use in paints, coatings, or inks (e.g. conductive pastes), in conductive lubricants or in plastics -Use as catalyst

	-Use as blasting abrasive -Compaction & sintering & injection moulding for the production of copper articles (e.g. sintered products, brake pads, carbon brushes, diamond tools) - Metallisation and spraying (e.g. thermal spraying, plasma spraying)
IW-7: Use of copper/ copper containing alloys flakes in metallic paints, coatings, colours, plastics as a catalyst or uses that result in articles	This use includes the following: -Use as metallic pigment in paints, coatings, colours or inks (e.g. printing inks, print products, plastics, cosmetic-products, anti-fouling coatings, spray cans, conductive pastes) -Use as catalyst -Compaction & sintering for the production of copper articles (e.g.carbon brushes)
IW-8: Use of copper/ copper containing alloys particulates and powders as brazing paste	This use includes the following: -Using brazing paste to join steel parts in a controlled atmospheric furnace. The temperature is brought in the furnace above the melting point of the brazing paste to complete the brazed joint.
IW9- Coating and electroplating	Plating of copper onto product or material using a copper plating anode
Uses by professional workers	
PW-1: Use of copper particulates and powders as brazing paste	This use includes the following: -Using brazing paste to join steel parts in a controlled atmospheric furnace. The temperature is brought in the furnace above the melting point of the brazing paste to complete the brazed joint.
PW-2: Use of copper particulates and powders as spray coating agent	This use includes the following: -Use as metallic pigment in paints, coatings, colours or inks (e.g. printing inks, print products, plastics, cosmetic-products, anti-fouling coatings, spray cans, conductive pastes)
PW-3: Professional use of copper solder	The use of copper solder in connections between copper pipes in plumbing systems as well as joints in sheet metal objects such as roof flashing, rain gutters and automobile radiators.
Consumer uses	
C-1: Use of copper particulates and powders as brazing paste	This use includes the following: -Using brazing paste to join steel parts in a controlled atmospheric furnace. The temperature is brought in the furnace above the melting point of the brazing paste to complete the brazed joint.
C-2: Use of copper particulates and powders as spray coating agent	This use includes the following: - Use as metallic pigment in paints, coatings, colours or inks (e.g. printing inks, print products, plastics, cosmetic-products, anti-fouling coatings, spray cans, conductive pastes)
C-3: Use of copper solder	The use of copper solder in connections between copper pipes in plumbing systems as well as joints in sheet metal objects such as roof flashing, rain gutters and automobile radiators.
C-4: Use of copper particulates and powders in cosmetic, cleaning and other body care products.	The use of copper particulates and powders in cosmetic products, such as care moistures.

Article service life	
SL-1: Professional installation and maintenance or use of copper containing articles	For example, placement and/or maintenance of roofs, wire, gutter and tubes, sintered articles, use of diamant tools, WEEE dissembling...
SL-2: Consumer use of articles with expected dermal exposure - indoors	Indoor articles of copper or containing copper: Articles that will remain indoors and/or under controlled conditions and handled by consumers regularly, e.g. coins, pots, sanitary equipment, sculptures, decorations, furniture, metallic paints…
SL-3: Consumer use of articles with no expected dermal exposure - indoors	Indoor articles of copper or containing copper: Articles that will remain indoors and/or under controlled conditions, but not usually manipulated by consumers, e.g. lamps, wire, sculptures, decorations, furniture…
SL-4: Consumer use of articles with expected environmental exposure - outdoors	Outdoor articles made of copper or containing copper: Articles that are in contact with environmental conditions: e.g furniture, sculptures, wire, gutters, roofs, brakes
SL-5: Professional use of copper containing semi-finished articles in the production finished articles or of “components” for other articles	For example, mechanical treatment (e.g. stamping, bending, cutting, milling) of semi-finished copper articles like coils, rods or profiles to produce finished articles (e.g. fittings) or components for other articles (e.g. components for electronics, mechanical components, air conditioning systems, etc.)

2.1. Manufacture

Table 1. Manufacture

Identifiers	Use descriptors which may be used depending on the individual process	Other information
M-1: Production of copper massive (cathode):	**Environmental release category (ERC):** ERC 1: Manufacture of substances **Process category (PROC):** PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature PROC 26: Handling of solid inorganic substances at ambient temperature **Exposure scenario and local assessment** 01. Raw material handling massive metal : PROC 26 02. Smelting and fire refining: PROC 22, PROC 23, PROC 8b 03. Electrolytic refining: PROC 3, PROC 4, PROC 8b 20. Raw material handling of scrap and fines, milling to fines: PROC 26 30. Hydro-metallurgical copper production closed batch process (synthesis or formulation) : PROC 3,4 **Environmental exposure scenario** 01. Exposure scenario (01) controlling environmental exposure for copper producers	
M-2: Production of copper powder	**Environmental release category (ERC):** ERC 1: Manufacture of substances **Process category (PROC):** PROC 27b: Production of metal powders (wet processes) PROC 22: Potentially closed processing operation with mineral/metals at elevated temperature. Industrial setting **Exposure scenario and local assessment** 24. Electrolytic powder production: PROCS 2,3,5,22,26,27b 07. Particulate, powder handling, mixing blending and weighing PROC 4,5,8a,8b,9,26 31. Powder production **Environmental exposure scenario** 01. Exposure scenario (01) controlling environmental exposure for copper producers	

2.2. Identified uses

Table 2. Formulation

Identifiers	Use descriptors which may be used depending on the individual process	Other information
F-1: Production of coated copper flakes	**Environmental release category (ERC):** ERC 2: Formulation of preparations **Process category (PROC):** PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC 6: Calendering operations PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles PROC 25: Other hot work operations with metals PROC 26: Handling of solid inorganic substances at ambient temperature **Exposure scenario and local assessment** 19. Copper flake powder production - ball milling PROC 26,24,6 07. Particulate, powder handling, mixing blending and weighing PROC 4,5,8a,8b,9,26 **Technical function of the substance during formulation:** Other: (no relevant) **Environmental exposure scenario** 01. Exposure scenario (01) controlling environmental exposure for copper producers	
F-2: Production of copper powder / coated copper flake containing preparations	**Environmental release category (ERC):** ERC 2: Formulation of preparations ERC 3: Formulation in materials **Process category (PROC):** PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)	

	PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation PROC 26: Handling of solid inorganic substances at ambient temperature **Exposure scenario and local assessment:** 07. Particulate, powder handling, mixing blending and weighing, PROC 4,5,8a,8b,9,26 15. Handling and use of particulate/powder in closed processes PROC 1,2,3,14 22. Use of particulates in liquids (e.g. brazing paste) PROC 1,2,3,4,5,26 **Product Category formulated:** PC 0: Metal Powder PC 7: Base metals and alloys PC 9a: Coatings and paints, thinners, paint removes PC 9b: Fillers, putties, plasters, modelling clay PC 14: Metal surface treatment products, including galvanic and electroplating products PC 24: Lubricants, greases, release products PC 32: Polymer preparations and compounds PC 38: Welding and soldering products (with flux coatings or flux cores.), flux products **Technical function of the substance during formulation:** Other: (no relevant) **Environmental exposure scenario:** Contributing exposure scenario (02) generic scenario for controlling environmental exposure	
F-3: Production of copper alloy shapes, ingots or melts	**Environmental release category (ERC):** ERC 2: Formulation of preparations **Process category (PROC):** PROC 21: Low energy manipulation of substances bound in materials and/or articles PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles PROC 25: Other hot work operations with metals PROC 26: Handling of solid inorganic substances at ambient temperature **Exposure scenario and local assessment:** 01. Raw material handling massive metal PROC 26 07. Particulate, powder handling, mixing blending and weighing PROC 4,5,8a,8b,9,26 15. Handling and use of particulate/powder in closed processes PROC 1,2,3,14 20. Raw material handling of scrap and fines, milling to fines PROC 26 23. Melting and casting PROC 21,22,23 **Product Category formulated:**	

	PC 0: Metals Powder PC 7: Base metals and alloys **Technical function of the substance during formulation:** Other (Structural) Colouring Heat transfer agents **Environmental exposure scenario:** Contributing exposure scenario (02) generic scenario for controlling environmental exposure	

Table 3. Uses at industrial sites

Identifiers	Use descriptors which may be used depending on the individual process	Other information
IW-1: Use of copper and copper alloy shapes for the production of shapes, ingots and /or copper containing articles.	**Process category (PROC):** PROC 21: Low energy manipulation of substances bound in materials and/or articles PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles PROC 25: Other hot work operations with metals PROC 26: Handling of solid inorganic substances at ambient temperature **Environmental release category (ERC):** ERC 7: Industrial use of substances in closest systems **Exposure scenario and local assessment:** 01. Raw material handling massive metal PROC 26 05. Low energy mechanical processing of cold metal PROC 21 20. Raw material handling of scrap and fines, milling to fines PROC 26 23. Melting and casting PROC 21,22,23 26. Surface treatment PROC 13 21,24 **Product Category formulated:** PC7: Base metals and alloys PC14: Metal surface treatment products, including galvanic and electroplating products **Technical function of the substance:** Other (Structural) **Environmental exposure scenario** (02) generic scenario for controlling environmental exposure	Subsequent service life relevant for that use: No

IW-2 Use of copper as intermediate for production of copper containing substances	**Process category (PROC):** PROC 21: Low energy manipulation of substances bound in materials and/or articles PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles PROC 25: Other hot work operations with metals PROC 26: Handling of solid inorganic substances at ambient temperature **Environmental release category (ERC):** ERC 7: Industrial use of substances in closest systems **Exposure scenario and local assessment:** 01. Raw material handling massive metal PROC 26 05. Low energy mechanical processing of cold metal PROC 21 20. Raw material handling of scrap and fines, milling to fines PROC 26 23. Melting and casting PROC 21,22,23 26. Surface treatment PROC 13 21,24 **Technical function of the substance:** Other (Intermediate) **Environmental exposure scenario** (02) generic scenario for controlling environmental exposure	Subsequent service life relevant for that use: No
IW-3: Use of copper /copper containing alloys for the fabrication of copper containing articles by mechanical processes (such as rolling, extrusion)	**Process category (PROC):** PROC 13: Treatment of articles by dipping and pouring PROC 21: Low energy manipulation of substances bound in materials and/or articles PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles) PROC 25: Other hot work operations with metals PROC 26: Handling of solid inorganic substances at ambient temperature **Environmental release category (ERC):** ERC 7: Industrial use of substances in closest systems ERC 5: Industrial use resulting in inclusion into or onto a matrix **Exposure scenario and local assessment:** 01. Raw material handling massive metal: PROC 26 05. Low energy mechanical processing of cold metal: PROC 21 09. High energy work up of metals PROC 24 12. Welding PROC 25	Subsequent service life relevant for that use: yes Link to the subsequent service life: SL-1: Professional installation and maintenance of copper containing articles SL-2: Consumer use of articles with expected dermal exposure - indoors SL-3: Consumer use of articles with no expected dermal exposure - indoors SL-4: Consumer use of articles with expected environmental exposure – outdoors

	14. Hot processes PROC 24 16. Etching PROC 13 26. Surface treatment PROC 21, 24,13 **Product category used:** PC 7: Base metals and alloys PC 38: Welding and soldering products (with flux coatings or flux cores.), flux products **Sector of end use:** SU 1: Agriculture, forestry, fishery SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment SU 16: Manufacture of computer, electronic and optical products, electrical equipment SU 17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment SU 18: Manufacture of furniture SU 19: Building and construction work SU 20: Health services SU 23: Electricity, steam, gas water supply and sewage treatment **Technical function of the substance:** Other (Structural) Heat transfer agent **Environmental exposure scenario** Contributing exposure scenario (02) generic scenario for controlling environmental exposure	SL-5: Professional use of copper containing semi-finished articles in the production finished articles or of "components" for other articles the production finished articles or of "components" for other articles
IW-4: Use of copper/ copper containing alloys for the fabrication of wire rod	**Process category (PROC):** PROC 21: Low energy manipulation of substances bound in materials and/or articles PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature PROC 26: Handling of solid inorganic substances at ambient temperature PROC 13: Treatment of articles by dipping and pouring **Exposure scenario and local assessment:** 01. Raw material handling massive metal: PROC 26 05. Low energy mechanical processing of cold metal: PROC 21 13. Continuous wire road production PROC 13 23. Melting and casting PROC 22,23,21 26. Surface treatment PROC 13,21,24	Subsequent service life relevant for that use: yes Link to the subsequent service life: SL-1: Professional installation and maintenance of copper containing articles SL-2: Consumer use of articles with expected dermal exposure - indoors SL-3: Consumer use of articles with no expected dermal exposure - indoors SL-4: Consumer use of articles with expected environmental exposure – outdoors SL-5: Professional use of copper

	Product category used: PC 14: Metal surface treatment products, including galvanic and electroplating products PC 7: Base metals and alloys **Sector of end use:** SU 1: Agriculture, forestry, fishery SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment SU 16: Manufacture of computer, electronic and optical products, electrical equipment SU 17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment SU 18: Manufacture of furniture SU 19: Building and construction work SU 20: Health services SU 23: Electricity, steam, gas water supply and sewage treatment **Technical function of the substance:** Heat transfer agents Conductive agents Other (Structural) **Environmental exposure scenario** Contributing exposure scenario (02) generic scenario for controlling environmental exposure	containing semi-finished articles in the production finished articles or of "components" for other articles the production finished articles or of "components" for other articles
IW-5: Use of copper/ copper containing alloys for the production of copper particulates and powders	**Process category (PROC):** PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting PROC 21: Low energy manipulation of substances bound in materials and/or articles PROC 25: Other hot work operations with metals PROC 26: Handling of solid inorganic substances at ambient temperature	Subsequent service life relevant for that use: No

	PROC 27a: Production of metals powders (hot processes) PROC 27b: Production of metals powders (wet processes) **Environmental release category (ERC):** ERC 5: Industrial use resulting in inclusion into or onto a matrix **Exposure scenario and local assessment:** 01. Raw material handling massive metal, PROC 26 04. Atomisation & Spray-Forming: PROC 21 07. Particulate, powder handling, mixing blending and weighing PROC 4,5,8a,8b,9,26 15. Handling and use of particulate/powder in closed processes PROCS 1,2,3,14 20. Raw material handling of scrap and fines, milling to fines PROC 26 21. Particulates forming/tableting reduction, stabilisation PROC 1,2,3,4,5,14 **Product Category formulated:** PC7: Base metals and alloys **Technical function of the substance** Colouring agents, pigments Conductive component Other (Structural) **Environmental exposure scenario:** (02) generic scenario for controlling environmental exposure	
IW-6: Use of copper/ copper containing alloys powder in metallic paints, coatings lubricants plastics, as a catalyst or uses that result in articles	**Environmental release category (ERC):** ERC 5: Industrial use resulting in inclusion into or onto a matrix ERC 4: Industrial use of processing aids in process and products, not becoming part of articles **Process category (PROC):** PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC 7: Industrial spraying PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC 10: Roller application or brushing PROC 11: Non industrial spraying	Link to the subsequent service life: SL-1: Professional installation and maintenance of copper containing articles SL-2: Consumer use of articles with expected dermal exposure - indoors SL-3: Consumer use of articles with no expected dermal exposure - indoors SL-4: Consumer use of articles with expected environmental exposure – outdoors SL-5: Professional use of copper containing semi-finished articles in the production finished articles or of “components” for other articles

PROC 14: Production of preparations or articles by tabletting, compression, extrusion, pelletisation
PROC 21: Low energy manipulation of substances bound in materials and/or articles
PROC 25: Other hot work operations with metals
PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature
PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles
PROC 26: Handling of solid inorganic substances at ambient temperature

Exposure scenario and local assessment:

07. Particulate, powder handling, mixing blending and weighing PROC 4,5,8a,8b,9,26
15. Handling and use of particulate/powder in closed processes PROC 1,2,3,14
20. Raw material handling of scrap and fines, milling to fines PROC 26
22. Use of particulates in liquids (e.g. brazing paste) PROC 1,2,3,4,5,26
27. Compaction & sintering & injection moulding PROC 14,21,22,23,24,25
28. Metallisation and thermal spraying PROC 7,11,24

Product Category used:

PC 7: Base metals and alloys
PC 9a: Coatings and paints, thinners, paint removes
PC 9b: Fillers, putties, plasters, modelling clay
PC 19: Intermediate
PC 20: Products such as ph-regulators, flocculants, precipitants, neutralisation agents
PC 14: Metal surface treatment products, including galvanic and electroplating products
PC 15: Non-metal-surface treatment products
PC 33: Semiconductors
PC 24: Lubricants, greases, release products
PC 25: Metal working fluids
PC 32: Polymer preparations and compounds
PC 38: Welding and soldering products (with flux coatings or flux cores.), flux products

Sector of end use:

SU 1: Agriculture, forestry and fishing
SU 5: Manufacture of textiles, leather, fur
SU 7: Printing and reproduction of recorded media
SU 8: Manufacture of bulk, large scale chemicals (including petroleum products)
SU 9: Manufacture of fine chemicals
SU 14: Manufacture of basic metals, including alloys
SU 15: Manufacture of fabricated metal products, except machinery and equipment
SU 16: Manufacture of computer, electronic and optical products, electrical equipment
SU 17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment
SU 18: Manufacture of furniture
SU 19: Building and construction work
SU 20: Health services

	SU 23: Electricity, steam, gas water supply and sewage treatment SU 24: Scientific research and development **Technical function of the substance:** Colouring agents, pigments Conductive component Others: (Structural) **Environmental exposure scenario** Contributing exposure scenario (02) generic scenario for controlling environmental exposure	
IW-7: Use of copper/ copper containing alloys flakes in metallic paints, coatings, colours, plastics, as catalyst or uses that result in articles	**Environmental release category (ERC):** ERC 5: Industrial use resulting in inclusion into or onto a matrix ERC 4: Industrial use of processing aids in process and products, not becoming part of articles **Process category (PROC):** PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC 6: Calendaring operations PROC 7: Industrial spraying PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC 10: Low energy spreading such as rolling, brushing PROC 11: Non industrial spraying PROC 14: Production of preparations or articles by tabletting, compression, extrusion, pelletisation PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles PROC 26: Handling of solid inorganic substances at ambient temperature **Exposure scenario and local assessment:** 07. Particulate, powder handling, mixing blending and weighing PROC 4,5,8a,8b,9,26 15. Handling and use of particulate/powder in closed processes PROC 1,2,3,14 20. Raw material handling of scrap and fines, milling to fines PROC 26 22. Use of particulates in liquids (e.g. brazing paste) PROC 1,2,3,4,5,26 28. Metallisation and thermal spraying PROC 7,11,24	Subsequent service life relevant for that use: yes Link to the subsequent service life: Link to the subsequent service life: SL-1: Professional installation and maintenance of copper containing articles SL-2: Consumer use of articles with expected dermal exposure - indoors SL-3: Consumer use of articles with no expected dermal exposure - indoors SL-4: Consumer use of articles with expected environmental exposure – outdoors SL-5: Professional use of copper containing semi-finished articles in the production finished articles or of “components” for other articles

	Product Category used: PC 7: Base metals and alloys PC 8: Biocidal products (e.g. disinfectants, pest control) PC 9a: Coatings and paints, thinners, paint removes PC 19: Intermediate PC 20: Products such as ph-regulators, flocculants, precipitants, neutralisation agents PC 27: Plant protection products PC 14: Metal surface treatment products, including galvanic and electroplating products PC 15: Non-metal-surface treatment products PC 24: Lubricants, greases, release products PC 25: Metal working fluids **Sector of end use:** SU 1: Agriculture, forestry and fishing SU 5: Manufacture of textiles, leather, fur SU 7: Printing and reproduction of recorded media SU 8: Manufacture of bulk, large scale chemicals (including petroleum products) SU 9: Manufacture of fine chemicals SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment SU 16: Manufacture of computer, electronic and optical products, electrical equipment SU 17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment SU 18: Manufacture of furniture SU 19: Building and construction work SU 20: Health services SU 23: Electricity, steam, gas water supply and sewage treatment SU 24: Scientific research and development **Technical function of the substance:** Colouring agents, pigments **Environmental exposure scenario** Contributing exposure scenario (02) generic scenario for controlling environmental exposure	
IW-8: Use of copper/ copper containing alloys particulates and powders as brazing paste	**Process category (PROC):** PROC 25: Other hot work operations with metals PROC 26: Handling of solid inorganic substances at ambient temperature **Environmental release category (ERC):** ERC 5: Industrial use resulting in inclusion into or onto a matrix	Subsequent service life relevant for that use: no

	Exposure scenario and local assessment: 12. Welding PROC 25 22. Use of particulates in liquids (e.g. brazing paste) PROC 1,2,3,4,5,26 29. Brazing and use of brazing paste PROC 25 **Product Category used:** PC 38: Welding and soldering products (with flux coatings or flux cores.), flux products **Sector of end use:** SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment SU 16: Manufacture of computer, electronic and optical products, electrical equipment SU 17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment SU 18: Manufacture of furniture SU 19: Building and construction work **Technical function of the substance:** Others: (Solder metals) **Environmental exposure scenario:** (02) generic scenario for controlling environmental exposure	
IW9- Coating and electroplating	**Process category (PROC):** PROC 13: Treatment of articles by dipping and pouring PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature PROC 27b Production of metal powders (wet processes) **Environmental release category (ERC):** ERC 5: Industrial use resulting in inclusion into or onto a matrix ERC 4: Industrial use of processing aids in process and products, not becoming part of articles **Exposure scenario and local assessment:** 11. Coating and electroplating PROC 13 25. Electrodeposition PROC 27b **Product Category used:** PC 9a: Coatings and paints, thinners, paint removes PC 14: Metal surface treatment products, including galvanic and electroplating products	Subsequent service life relevant for that use: no

	Sector of end use: SU 17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment **Technical function of the substance:** Complexing agents **Environmental exposure scenario:** (02) generic scenario for controlling environmental exposure	

Table 4. Uses by professional workers

Identifiers		**Other information**
PW-1:Use of copper particulates and powders as brazing paste	**Environmental release category (ERC):** ERC 8c: Wide dispersive indoor use resulting in inclusion into or onto a matrix ERC 8f: Wide dispersive outdoor use resulting in inclusion into or onto a matrix **Process category (PROC):** PROC 25: Other hot work operations with metals **Exposure scenario and local assessment:** 29. Brazing and use of brazing paste PROC 25. 12. Welding PROC 25 **Product Category used:** PC 38: Welding and soldering products (with flux coatings or flux cores.), flux products **Sector of end use:** SU 24: Scientific research and development SU 23: Electricity, steam, gas water supply and sewage treatment SU 19: Building and construction work SU 18: Manufacture of furniture SU 17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment SU 16: Manufacture of computer, electronic and optical products, electrical equipment SU 15: Manufacture of fabricated metal products, except machinery and equipment SU 14: Manufacture of basic metals, including alloys SU 2a: Mining (without offshore industries) **Technical function of the substance:** Other (Solder metal)	Subsequent service life relevant for that use: No

PW-2: Use as spray coating agent (handling of preparation in sealed container)	**Environmental release category (ERC):** ERC 8c: Wide dispersive indoor use resulting in inclusion into or onto a matrix ERC 8f: Wide dispersive outdoor use resulting in inclusion into or onto a matrix ERC 9a: Wide dispersive indoor use of substances in closed systems ERC 9b: Wide dispersive outdoor use of substances in closed systems **Process category (PROC):** PROC 10: Roller application or brushing PROC 11: Non industrial spraying **Exposure scenario and local assessment:** 17. Handling of substances or preparation in sealed containers PROC 10,11 **Product Category used:** PC 7: Base metals and alloys PC 8: Biocidal products (e.g. disinfectants, pest control) PC 9a: Coatings and paints, thinners, paint removes PC 9b: Fillers, putties, plasters, modelling clay PC 14: Metal surface treatment products, including galvanic and electroplating products PC 15: Non-metal-surface treatment products PC 21: Laboratory chemicals PC 24: Lubricants, greases, release products PC 25: Metal working fluids PC 31: Polishes and wax blends PC 32: Polymer preparations and compounds PC 26: Paper and board dye, finishing and impregnation products: including bleaches and other processing aids PC 35: Washing and cleaning products (including solvent based products) PC 39: Cosmetics, personal care products **Technical function of the substance:** Colouring agents, pigments Plating agents and metal surface treating agents	Subsequent service life relevant for that use: NO
PW-3: Professional use of copper solder	**Environmental release category (ERC):** ERC 8c: Wide dispersive indoor use resulting in inclusion into or onto a matrix ERC 8f: Wide dispersive outdoor use resulting in inclusion into or onto a matrix **Process category (PROC):** PROC 25: Other hot work operations with metals **Exposure scenario and local assessment:** 12. Welding PROC 25	

	Product Category used: PC 38: Welding and soldering products (with flux coatings or flux cores.), flux products **Sector of end use:** SU 24: Scientific research and development SU 23: Electricity, steam, gas water supply and sewage treatment SU 19: Building and construction work SU 18: Manufacture of furniture SU 17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment SU 16: Manufacture of computer, electronic and optical products, electrical equipment SU 15: Manufacture of fabricated metal products, except machinery and equipment SU 14: Manufacture of basic metals, including alloys SU 2a: Mining (without offshore industries) **Technical function of the substance:** Other (Solder metal)	

Table 5. Consumer uses

Identifiers		**Other information**
C-1:Use of copper particulates and powders as brazing paste	**Environmental release category (ERC):** ERC 8c: Wide dispersive indoor use resulting in inclusion into or onto a matrix ERC 8f: Wide dispersive outdoor use resulting in inclusion into or onto a matrix **Process category (PROC):** PROC 25: Other hot work operations with metals **Exposure scenario and local assessment:** 12. Welding PROC 25 29. Brazing and use of brazing paste PROC 25. **Product Category used:** PC 38: Welding and soldering products (with flux coatings or flux cores.), flux products **Technical function of the substance:** Other (Solder metal)	
C-2: Use as spray coating agent	**Environmental release category (ERC):** ERC 8c: Wide dispersive indoor use resulting in inclusion into or onto a matrix ERC 8f: Wide dispersive outdoor use resulting in inclusion into or onto a matrix ERC 9a: Wide dispersive indoor use of substances in closed systems ERC 9b: Wide dispersive outdoor use of substances in closed systems	Subsequent service life relevant for that use: NO

	Exposure scenario and local assessment: 18. Consumer exposure to copper metal, copper powder or copper containing products **Product Category used:** PC 9b: Fillers, putties, plasters, modelling clay PC 14: Metal surface treatment products, including galvanic and electroplating products PC 15: Non-metal-surface treatment products PC 21: Laboratory chemicals PC 24: Lubricants, greases, release products PC 25: Metal working fluids PC 31: Polishes and wax blends PC 32: Polymer preparations and compounds PC 26: Paper and board dye, finishing and impregnation products: including bleaches and other processing aids **Technical function of the substance:** Plating agents and metal surface treating agents Colouring agents, pigments	
C-3: Use of copper solder	**Environmental release category (ERC):** ERC 8c: Wide dispersive indoor use of processing aids in open systems ERC 8f: Wide dispersive indoor use of reactive substances in open systems **Exposure scenario and local assessment:** 12. Welding PROC 25 **Product Category used:** PC 38: Welding and soldering products (with flux coatings or flux cores.), flux products **Technical function of the substance:** Other (Solder metal)	
C-4: Use of copper particulates and powders in cosmetic, cleaning and other body care products.	**Environmental release category (ERC):** ERC 8a: Wide dispersive indoor use resulting in inclusion into or onto a matrix ERC 8b: Wide dispersive outdoor use resulting in inclusion into or onto a matrix. **Exposure scenario and local assessment:** 18. Consumer exposure to copper metal, copper powder or copper containing products **Product Category used:** PC 39: Cosmetics, personal care products **Technical function of the substance:** Complexing agent	

Table 6. Article service life

Identifiers		Other information
SL-1: Professional installation and maintenance or use of copper containing articles	**Article category related to subsequent service life (AC):** AC 7: Metal articles **Environmental release category** ERC 10a Wide dispersive outdoor use of long-life articles and materials with low release ERC 12a: Industrial processing of articles with abrasive techniques (low release) ERC 12b: Industrial processing of articles with abrasive techniques (high release) **Process category** PROC: 21 Low energy manipulation of substances bound in materials and/or articles PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles **Exposure scenario and local assessment:** 18. Consumer exposure to copper metal, copper powder or copper containing products	Article used by: workers
SL-2: Consumer use of articles with expected dermal exposure - indoors	**Article category related to subsequent service life (AC):** AC 7: Metal articles **Environmental release category** ERC: 11a wide dispersive indoor use of long –life articles and materials with low release **Exposure scenario and local assessment:** 18. Consumer exposure to copper metal, copper powder or copper containing products	Article used by: consumers
SL-3: Consumer use of articles with no expected dermal exposure - indoors	**Article category related to subsequent service life (AC):** AC 7: Metal articles **Environmental release category** ERC: 11a wide dispersive indoor use of long –life articles and materials with low release **Exposure scenario and local assessment:** 18. Consumer exposure to copper metal, copper powder or copper containing products	Article used by: consumers
SL-4: Consumer use of articles with expected environmental exposure - outdoors	**Article category related to subsequent service life (AC):** AC 7: Metal articles **Environmental release category** ERC 10a: wide dispersive outdoor use of long-life articles and materials with low release ERC 10b: wide dispersive outdoor use of long-life articles and materials with high or intended release	Article used by: consumers

	(including abrasive processing) **Exposure scenario and local assessment:** 18. Consumer exposure to copper metal, copper powder or copper containing products	
SL-5: Professional use of copper containing semi-finished articles in the production finished articles or of “components” for other articles	**Article category related to subsequent service life (AC):** AC 7: Metal articles **Environmental release category** ERC 12a: Industrial processing of articles with abrasive techniques (low release) ERC 12b: Industrial processing of articles with abrasive techniques (high release) **Process category** PROC 21 Low energy manipulation of substances bound in materials and/or articles PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles **Exposure scenario and local assessment:** 18. Consumer exposure to copper metal, copper powder or copper containing products	Article used by: workers