

2. MANUFACTURE AND USES

2.1. Manufacture

Manufacturing process Production of copper massive: Hydrometallurgical route - see also Reference document on Best available Techniques for Non-ferrous metal industries

The primary¹ and secondary² 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 copper³ 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 - see also Reference document on Best available Techniques for Non-ferrous metal industries

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 °C (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 °C 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.

Manufacturing process -Production of copper powders.

Copper powders are produced mainly by water or air atomisation and by oxide reduction of molten copper. They can also be made by chemical and electrolytic processes.

¹ Primary copper : copper produced from primary raw materials (copper ores).

² Secondary copper : copper produced from secondary raw materials (scrap)

³ Black copper is a metallic intermediate formed during secondary copper production. Black copper is produced by melting and/or processing of metallic scrap and/or oxidic bearing materials (slag, oxides, ashes).

During atomisation molten metal is broken up into small droplets and rapidly frozen before the drops come into contact with each other or with a solid surface. The principle method is to disintegrate a thin stream of molten metal by subjecting it to the impact of high-energy jets of gas

Manufacturing process Production of copper powders used as catalysts.

Copper is produced via the partial or full reduction of a copper oxide containing catalyst precursor in a closed reaction vessel using hydrogen at elevated temperature. The catalyst product is then stabilised using air, which involves partial reoxidation of the copper metal. The resultant powder is formed into high density solid pellets of particular shapes and sizes.

Manufacturing process- Production of coated copper flakes.

The raw materials are melted in an electric induction furnace. The resulting molten copper has compressed air blown through it to produce fine spherical particles. These particles are then transferred to ball mills such that the spherical particle is physically changed to produce a flake. Zinc stearate or alternatively stearic acid are added during the milling process to assist the milling process.

2.2. Identified uses

Manufacture

Manufacturing stage –industrial:

M1. Production of copper cathodes (primary and secondary production) and fire-refined ingots

Identified uses

The identified uses for Copper are listed below. Some of these have been exemplified in

Figure 1.

Downstream and Formulation stages –industrial

DM1 - Production of copper fire-refined ingots, and unwrought shapes (billets, slabs and cakes, etc)

DM2 - Production of copper particulates and powders (including catalyst pellets) – eg thermal, hydrometallurgical and electrochemical productions

F1. Production of alloys, in which copper is the main constituent, as well as where it is minor alloying element (eg in stainless steel, in alloy particulates, in alloy shapes, etc)

F2. Production of copper-powder containing preparations (eg brazing paste, pigment paints, etc)

Uses of copper as such or in preparation, including production of articles

U1. Production of copper containing articles (finished and semi-finished products - e.g. wire rod, wires, bars, sections, tubes, strip/sheet, cables and cast products)

U2. Production of articles made from copper and copper containing particulates (eg sintered products)

U3. Use as intermediate in the production of other copper containing substances

U4. Use as brazing paste (handling of preparation by industrial worker)

U5. Use as catalyst (handling of powder by industrial worker)

Service life stage (article or preparation in sealed container) –consumers, professional /industrial workers

S1. Use of article (handling by consumer) - e.g. handling coins

S2. Use of article (handling by professional worker) - e.g. installing roofs and tubes

S3. Use as spray coating agent (handling of preparation in sealed container)

S4. Use of article made from copper and copper-containing particulates - e.g. brake

End-of-life stage⁴

EoL1. Of industrial wastes -eg recycling and recovery as raw material

EoL2. Of private wastes eg collecting, recovery, and disposal

⁴ the handling and treatment of substances in waste is not a downstream use under REACH

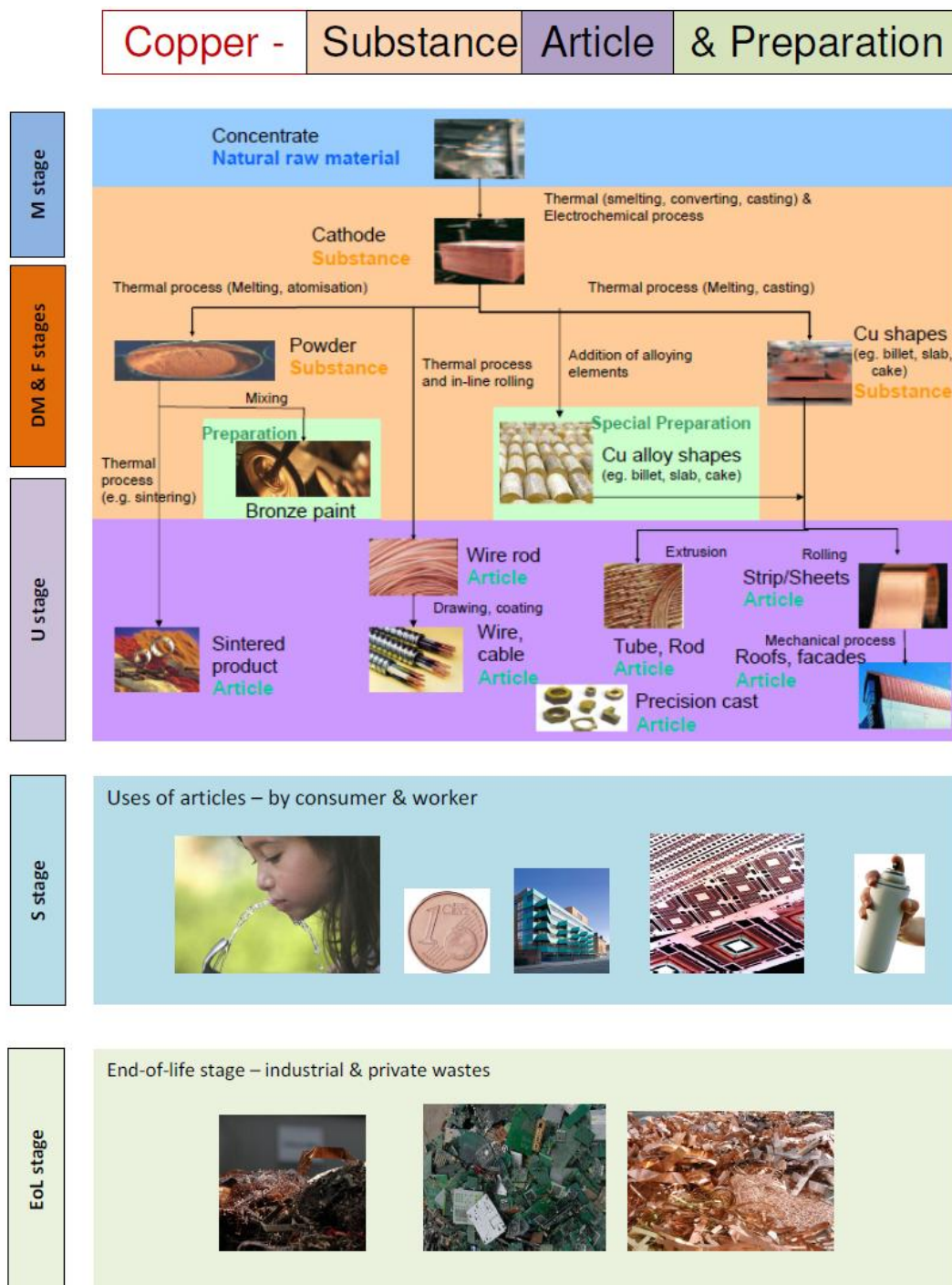


Figure 1 Exemplified supply chain of copper metal and copper powder

The detailed use descriptors are outlined in the tables below

EC number:
231-159-6

Al copper

CAS number:
7440-50-8

Table 1. Uses by workers in industrial settings

Confidential	IU number	Identified Use (IU) name	Substance supplied to that use	Use descriptors
	1	Raw material handling massive metal	as such (substance itself)	<p>Process category (PROC): PROC 26: Handling of solid inorganic substances at ambient temperature</p> <p>Market sector by type of chemical product: PC 7: Base metals and alloys</p> <p>Environmental release category (ERC): ERC 5: Industrial use resulting in inclusion into or onto a matrix ERC 6a: Industrial use resulting in manufacture of another substance (use of intermediates) ERC 6b: Industrial use of reactive processing aids ERC 6c: Industrial use of monomers for manufacture of thermoplastics ERC 6d: Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers ERC 7: Industrial use of substances in closed systems ERC 12a: Industrial processing of articles with abrasive techniques (low release) ERC 12b: Industrial processing of articles with abrasive techniques (high release) ERC 3: Formulation in materials ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles ERC 2: Formulation of preparations ERC 1: Manufacture of substances</p> <p>Sector of end use (SU): SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment</p> <p>Subsequent service life relevant for that use?: no</p>
	20	Raw material handling of scrap and fines, milling to fines	as such (substance itself)	<p>Process category (PROC): PROC 26: Handling of solid inorganic substances at ambient temperature</p> <p>Market sector by type of chemical product:</p>

				<p>PC 7: Base metals and alloys</p> <p>Environmental release category (ERC):</p> <p>ERC 1: Manufacture of substances ERC 2: Formulation of preparations ERC 3: Formulation in materials ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles ERC 5: Industrial use resulting in inclusion into or onto a matrix ERC 6a: Industrial use resulting in manufacture of another substance (use of intermediates) ERC 6b: Industrial use of reactive processing aids ERC 6c: Industrial use of monomers for manufacture of thermoplastics ERC 6d: Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers ERC 7: Industrial use of substances in closed systems ERC 12a: Industrial processing of articles with abrasive techniques (low release) ERC 12b: Industrial processing of articles with abrasive techniques (high release)</p> <p>Sector of end use (SU):</p> <p>SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment</p> <p>Subsequent service life relevant for that use?: no</p>
	7	Particulate, powder handling, mixing blending and weighing	as such (substance itself) in a mixture	<p>Process category (PROC):</p> <p>PROC 26: Handling of solid inorganic substances at ambient temperature 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)</p> <p>Market sector by type of chemical product:</p> <p>PC 7: Base metals and alloys PC 8: Biocidal products (e.g. disinfectants, pest control)</p>

				<p>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</p> <p>Environmental release category (ERC): ERC 1: Manufacture of substances ERC 2: Formulation of preparations ERC 3: Formulation in materials ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles ERC 5: Industrial use resulting in inclusion into or onto a matrix ERC 6a: Industrial use resulting in manufacture of another substance (use of intermediates) ERC 6b: Industrial use of reactive processing aids ERC 6d: Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers ERC 7: Industrial use of substances in closed systems ERC 12a: Industrial processing of articles with abrasive techniques (low release) ERC 12b: Industrial processing of articles with abrasive techniques (high release)</p> <p>Sector of end use (SU): SU 1: Agriculture, forestry and fishing SU 7: Printing and reproduction of recorded media SU 5: Manufacture of textiles, leather, fur SU 9: Manufacture of fine chemicals SU 10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys) SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment SU 8: Manufacture of bulk, large scale chemicals (including petroleum products)</p> <p>Subsequent service life relevant for that use?: yes</p>
	15	Handling and use of particulate/powder in closed processes	as such (substance itself) in a mixture	<p>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 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation</p> <p>Sector of end use (SU):</p>

				<p>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 17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment</p> <p>Subsequent service life relevant for that use?: yes</p>
	21	Particulates forming/tabletting reduction, stabilisation	as such (substance itself) in a mixture	<p>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</p> <p>Environmental release category (ERC): ERC 2: Formulation of preparations ERC 3: Formulation in materials ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles ERC 5: Industrial use resulting in inclusion into or onto a matrix ERC 6a: Industrial use resulting in manufacture of another substance (use of intermediates) ERC 6b: Industrial use of reactive processing aids ERC 6d: Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers ERC 7: Industrial use of substances in closed systems ERC 12b: Industrial processing of articles with abrasive techniques (high release) ERC 12a: Industrial processing of articles with abrasive techniques (low release) ERC 1: Manufacture of substances</p> <p>Sector of end use (SU): 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 8: Manufacture of bulk, large scale chemicals (including petroleum products)</p> <p>Subsequent service life relevant for that use?: yes</p>

22	Use of particulates in liquids (e.g. brazing paste)	as such (substance itself) in a mixture	<p>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 26: Handling of solid inorganic substances at ambient temperature</p> <p>Environmental release category (ERC): ERC 11b: Wide dispersive indoor use of long-life articles and materials with high or intended release (including abrasive processing)</p> <p>Sector of end use (SU): 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</p> <p>Subsequent service life relevant for that use?: yes</p>
2	Smelting and fire refining	as such (substance itself)	<p>Process category (PROC): 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</p> <p>Environmental release category (ERC): ERC 1: Manufacture of substances</p> <p>Sector of end use (SU): SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment</p> <p>Subsequent service life relevant for that use?: yes</p>
23	Melting and casting	as such (substance itself)	<p>Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure</p>

			in a mixture	<p>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 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</p> <p>Market sector by type of chemical product: PC 7: Base metals and alloys PC 33: Semiconductors</p> <p>Environmental release category (ERC): ERC 2: Formulation of preparations ERC 12a: Industrial processing of articles with abrasive techniques (low release)</p> <p>Sector of end use (SU): SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment</p> <p>Subsequent service life relevant for that use?: yes</p>
	13a	Continuous dipping	as such (substance itself) in a mixture	<p>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 24: High (mechanical) energy work-up of substances bound in materials and/or articles</p> <p>Sector of end use (SU): SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment</p> <p>Subsequent service life relevant for that use?: yes</p>
	13b	Hot processes	as such (substance itself)	<p>Process category (PROC): PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles</p>

			in a mixture	<p>ERC 6: Industrial use resulting in manufacture of another substance (use of intermediates)</p> <p>Sector of end use (SU):</p> <p>SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment SU 17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment</p> <p>Subsequent service life relevant for that use?: yes</p>
9	Heat treatment	as such (substance itself)	in a mixture	<p>Process category (PROC):</p> <p>PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles</p> <p>Sector of end use (SU):</p> <p>SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment</p> <p>Subsequent service life relevant for that use?: yes</p>
3	Electrolytic refining	as such (substance itself)	in a mixture	<p>Process category (PROC):</p> <p>PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature</p> <p>Sector of end use (SU):</p> <p>SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment</p> <p>Subsequent service life relevant for that use?: yes</p>
24	Electrolytic powder production	as such (substance itself)	in a mixture	<p>Process category (PROC):</p> <p>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 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting PROC 26: Handling of solid inorganic substances at ambient temperature PROC 27b: Production of metal powders (wet processes)</p> <p>Market sector by type of chemical product:</p>

				<p>PC 7: Base metals and alloys PC 12: Fertilisers PC 19: Intermediate PC 24: Lubricants, greases, release products PC 25: Metal working fluids PC 27: Plant protection products</p> <p>Environmental release category (ERC): ERC 1: Manufacture of substances</p> <p>Sector of end use (SU): SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment</p> <p>Subsequent service life relevant for that use?: yes</p>
	25	Electrodeposition	as such (substance itself) in a mixture	<p>Process category (PROC): PROC 27b: Production of metal powders (wet processes)</p> <p>Sector of end use (SU): SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment</p> <p>Subsequent service life relevant for that use?: yes</p>
	11	Coating & Electroplating	as such (substance itself) in a mixture	<p>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</p> <p>Sector of end use (SU): SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment</p> <p>Subsequent service life relevant for that use?: yes</p>
	26	Surface treatment	as such (substance	<p>Process category (PROC):</p>

			<p>itself) in a mixture</p>	<p>PROC 13: Treatment of articles by dipping and pouring PROC 21: Low energy manipulation of substances bound in materials and/or articles 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</p> <p>Market sector by type of chemical product: PC 14: Metal surface treatment products, including galvanic and electroplating products</p> <p>Environmental release category (ERC): ERC 6b: Industrial use of reactive processing aids</p> <p>Sector of end use (SU): 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</p> <p>Subsequent service life relevant for that use?: yes</p>
	4	Atomisation & spray-forming	<p>as such (substance itself) in a mixture</p>	<p>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 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting PROC 26: Handling of solid inorganic substances at ambient temperature PROC 27a: Production of metal powders (hot processes)</p> <p>Market sector by type of chemical product: PC 7: Base metals and alloys PC 12: Fertilisers PC 19: Intermediate PC 24: Lubricants, greases, release products PC 25: Metal working fluids PC 27: Plant protection products</p>

				<p>Environmental release category (ERC): ERC 1: Manufacture of substances</p> <p>Sector of end use (SU): SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment</p> <p>Subsequent service life relevant for that use?: yes</p>
27	Compaction & sintering & injection moulding	as such (substance itself) in a mixture	<p>Process category (PROC): PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation 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</p> <p>Market sector by type of chemical product: PC 7: Base metals and alloys PC 24: Lubricants, greases, release products PC 25: Metal working fluids</p> <p>Sector of end use (SU): SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment</p> <p>Subsequent service life relevant for that use?: yes</p>	
28	Metallisation and thermal spraying	as such (substance itself) in a mixture	<p>Process category (PROC): PROC 7: Industrial spraying PROC 11: Non industrial spraying 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</p> <p>Market sector by type of chemical product: PC 14: Metal surface treatment products, including galvanic and electroplating products</p>	

				<p>PC 15: Non-metal-surface treatment products PC 33: Semiconductors PC 7: Base metals and alloys PC 24: Lubricants, greases, release products PC 25: Metal working fluids</p> <p>Environmental release category (ERC): ERC 3: Formulation in materials ERC 5: Industrial use resulting in inclusion into or onto a matrix ERC 12b: Industrial processing of articles with abrasive techniques (high release)</p> <p>Sector of end use (SU): SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment SU 17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment SU 16: Manufacture of computer, electronic and optical products, electrical equipment</p> <p>Subsequent service life relevant for that use?: yes</p>
	5	Low energy mechanical processing of cold metal	as such (substance itself) in a mixture	<p>Process category (PROC): PROC 21: Low energy manipulation of substances bound in materials and/or articles</p> <p>Market sector by type of chemical product: PC 7: Base metals and alloys</p> <p>Environmental release category (ERC): ERC 12a: Industrial processing of articles with abrasive techniques (low release) ERC 5: Industrial use resulting in inclusion into or onto a matrix ERC 10a: Wide dispersive outdoor use of long-life articles and materials with low release ERC 11a: Wide dispersive indoor use of long-life articles and materials with low release ERC 12b: Industrial processing of articles with abrasive techniques (high release)</p> <p>Sector of end use (SU): SU 18: Manufacture of furniture SU 19: Building and construction work SU 23: Electricity, steam, gas water supply and sewage treatment SU 17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment SU 20: Health services</p>

				Subsequent service life relevant for that use?: yes
	12	Welding	as such (substance itself) in a mixture	<p>Process category (PROC): PROC 25: Other hot work operations with metals</p> <p>Market sector by type of chemical product: PC 7: Base metals and alloys PC 38: Welding and soldering products (with flux coatings or flux cores.), flux products</p> <p>Environmental release category (ERC): ERC 11b: Wide dispersive indoor use of long-life articles and materials with high or intended release (including abrasive processing)</p> <p>Sector of end use (SU): SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment SU 19: Building and construction work SU 17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment</p> <p>Subsequent service life relevant for that use?: yes</p>
	29	Brazing and use of brazing paste	as such (substance itself) in a mixture	<p>Process category (PROC): PROC 25: Other hot work operations with metals</p> <p>Market sector by type of chemical product: PC 7: Base metals and alloys PC 38: Welding and soldering products (with flux coatings or flux cores.), flux products</p> <p>Environmental release category (ERC): ERC 11b: Wide dispersive indoor use of long-life articles and materials with high or intended release (including abrasive processing)</p> <p>Sector of end use (SU): SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment SU 17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment</p>

				<p>Subsequent service life relevant for that use?: yes</p>
	16	Etching	<p>as such (substance itself)</p> <p>in a mixture</p>	<p>Process category (PROC): PROC 21: Low energy manipulation of substances bound in materials and/or articles</p> <p>Market sector by type of chemical product: PC 7: Base metals and alloys</p> <p>Sector of end use (SU): 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 18: Manufacture of furniture</p> <p>Subsequent service life relevant for that use?: yes</p>
	19	Copper flake powder production - ball milling	<p>as such (substance itself)</p> <p>in a mixture</p>	<p>Process category (PROC): PROC 6: Calendering operations 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</p> <p>Market sector by type of chemical product: PC 7: Base metals and alloys PC 9c: Finger paints PC 9b: Fillers, putties, plasters, modelling clay PC 9a: Coatings and paints, thinners, paint removes PC 24: Lubricants, greases, release products PC 25: Metal working fluids</p> <p>Environmental release category (ERC): ERC 1: Manufacture of substances</p> <p>Sector of end use (SU): SU 14: Manufacture of basic metals, including alloys SU 15: Manufacture of fabricated metal products, except machinery and equipment</p> <p>Subsequent service life relevant for that use?: yes</p>

EC number:
231-159-6

A1 copper

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7440-50-8

30	Hydro-metallurgical copper production	as such (substance itself)	<p>Process category (PROC): PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature</p> <p>Environmental release category (ERC): ERC 1: Manufacture of substances</p> <p>Sector of end use (SU): SU 14: Manufacture of basic metals, including alloys</p> <p>Subsequent service life relevant for that use?: yes</p>
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Table 2. Uses by professional workers

Confidential	IU number	Identified Use (IU) name	Substance supplied to that use	Use descriptors
	12	Welding	as such (substance itself) in a mixture	<p>Process category (PROC): PROC 25: Other hot work operations with metals</p> <p>Market sector by type of chemical product: PC 7: Base metals and alloys</p> <p>Environmental release category (ERC): ERC 3: Formulation in materials</p> <p>Sector of end use (SU):</p> <p>Subsequent service life relevant for that use?: yes</p> <p>Article category related to subsequent service life (AC):</p>
	5	Low energy mechanical processing of cold metal	as such (substance itself) in a mixture	<p>Process category (PROC): PROC 21: Low energy manipulation of substances bound in materials and/or articles</p> <p>Market sector by type of chemical product: PC 7: Base metals and alloys</p>

				<p>Sector of end use (SU):</p> <p>Subsequent service life relevant for that use?: yes</p> <p>Article category related to subsequent service life (AC):</p>
	17	Handling of substances or preparation in sealed containers	as such (substance itself) in a mixture	<p>Process category (PROC): PROC 10: Roller application or brushing PROC 11: Non industrial spraying</p> <p>Environmental release category (ERC): ERC 8c: Wide dispersive indoor use resulting in inclusion into or onto a matrix ERC 10a: Wide dispersive outdoor use of long-life articles and materials with low release ERC 11a: Wide dispersive indoor use of long-life articles and materials with low release</p> <p>Subsequent service life relevant for that use?: yes</p>
	18	Handling of articles by professional workers	as such (substance itself) in a mixture	<p>Process category (PROC): PROC 13: Treatment of articles by dipping and pouring</p> <p>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 10a: Wide dispersive outdoor use of long-life articles and materials with low release ERC 11a: Wide dispersive indoor use of long-life articles and materials with low release ERC 8d: Wide dispersive outdoor use of processing aids in open systems ERC 8e: Wide dispersive outdoor use of reactive substances in open systems ERC 8a: Wide dispersive indoor use of processing aids in open systems ERC 8b: Wide dispersive indoor use of reactive substances in open systems ERC 9a: Wide dispersive indoor use of substances in closed systems ERC 9b: Wide dispersive outdoor use of substances in closed systems ERC 10a Wide dispersive outdoor use of long-life articles and materials with low release (including abrasive processing) ERC 10b: Wide dispersive outdoor use of long-life articles and materials with high or intended release (including abrasive processing) ERC 11a: Wide dispersive outdoor use of long-life articles and materials with low release (including abrasive processing)</p>

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				<p>ERC 11b: Wide dispersive indoor use of long-life articles and materials with high or intended release (including abrasive processing)</p> <p>Subsequent service life relevant for that use?: yes</p> <p>Article category related to subsequent service life (AC):</p>
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Table 3. Uses by consumers

Confidential	IU number	Identified Use (IU) name	Use descriptors
	18	Consumer exposure to copper metal, copper powder or copper containing products	<p>Chemical product category (PC):</p> <p>PC 7: Base metals and alloys PC 3: Air care products PC 8: Biocidal products (e.g. disinfectants, pest control) PC 9a: Coatings and paints, thinners, paint removers PC 9b: Fillers, putties, plasters, modelling clay PC 9c: Finger paints PC 14: Metal surface treatment products, including galvanic and electroplating products PC 18: Ink and toners PC 19: Intermediate PC 21: Laboratory chemicals PC 24: Lubricants, greases, release products PC 25: Metal working fluids PC 26: Paper and board dye, finishing and impregnation products: including bleaches and other processing aids PC 31: Polishes and wax blends PC 32: Polymer preparations and compounds PC 35: Washing and cleaning products (including solvent based products) PC 39: Cosmetics, personal care products</p> <p>Environmental release category (ERC):</p> <p>ERC 10a: Wide dispersive outdoor use of long-life articles and materials with low release ERC 11a: Wide dispersive indoor 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 (including abrasive processing) ERC 8a: Wide dispersive indoor use of processing aids in open systems</p>

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			<p>ERC 8b: Wide dispersive indoor use of reactive substances in open systems ERC 8c: Wide dispersive indoor use resulting in inclusion into or onto a matrix ERC 8d: Wide dispersive outdoor use of processing aids in open systems ERC 8e: Wide dispersive outdoor use of reactive substances in open systems 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</p> <p>Subsequent service life relevant for that use?: yes</p> <p>Article category related to subsequent service life (AC): AC 7: Metal articles AC 1: Vehicles AC 2: Machinery, mechanical appliances, electrical/electronic articles AC 3: Electrical batteries and accumulators</p>
	12	Welding	<p>Chemical product category (PC): PC 7: Base metals and alloys PC 38: Welding and soldering products (with flux coatings or flux cores.), flux products</p> <p>Environmental release category (ERC): ERC 8f: Wide dispersive outdoor use resulting in inclusion into or onto a matrix ERC 8c: Wide dispersive indoor use resulting in inclusion into or onto a matrix</p> <p>Subsequent service life relevant for that use?: yes</p> <p>Article category related to subsequent service life (AC): AC 7: Metal articles</p>

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	5	Low energy mechanical processing of cold metal	Chemical product category (PC): PC 7: Base metals and alloys Environmental release category (ERC): ERC 8f: Wide dispersive outdoor use resulting in inclusion into or onto a matrix ERC 8c: Wide dispersive indoor use resulting in inclusion into or onto a matrix ERC 10a: Wide dispersive outdoor use of long-life articles and materials with low release ERC 11a: Wide dispersive indoor use of long-life articles and materials with low release Subsequent service life relevant for that use?: yes Article category related to subsequent service life (AC): AC 7: Metal articles
	17	Handling of substances or preparation in sealed containers	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 Subsequent service life relevant for that use?: yes

Most common technical function of substance (what it does):

Biocide substances
conducting electricity, exchanging heat, architectural applications

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