

Copper Chemicals

for high demands





Leaders in quality and service

TIB Chemicals originates from the merger of Goldschmidt TIB Germany and Goldschmidt Quimica de México. As manufacturer of specialised Basic Chemicals, innovative Inorganic Specialty Chemicals and Coating Systems, the company supplies to a worldwide market.

The largest production facilities of TIB Chemicals are located in Mannheim (Germany) as well as San Luis Potosi (Mexico). The sales and marketing organisation operates globally, with representations on all continents.

Employing approximately 350 qualified personnel, the TIB Chemicals manufacturing history dates back over 130 years of tradition and know-how. With a yearly production of more than 400.000 tons of chemicals, TIB Chemicals generates revenues of over € 120 million.

The yearly growth of TIB Chemicals' accrual rate is above the average for the industry. High-quality products, custom-made solutions and a flexible distribution and logistics service for our entire customer base are the basis of our success. Customer requirements are met with prompt and individual attention. We thereby focus on our main target, to increase and to enhance the business success of our clients.

Subdivided into three business units, the company operates Basic Chemicals, Inorganic Specialty Chemicals and Coating Systems. Combined they form a strong unit with a solid financial base and with the logistic and organisational structure of a large international enterprise.

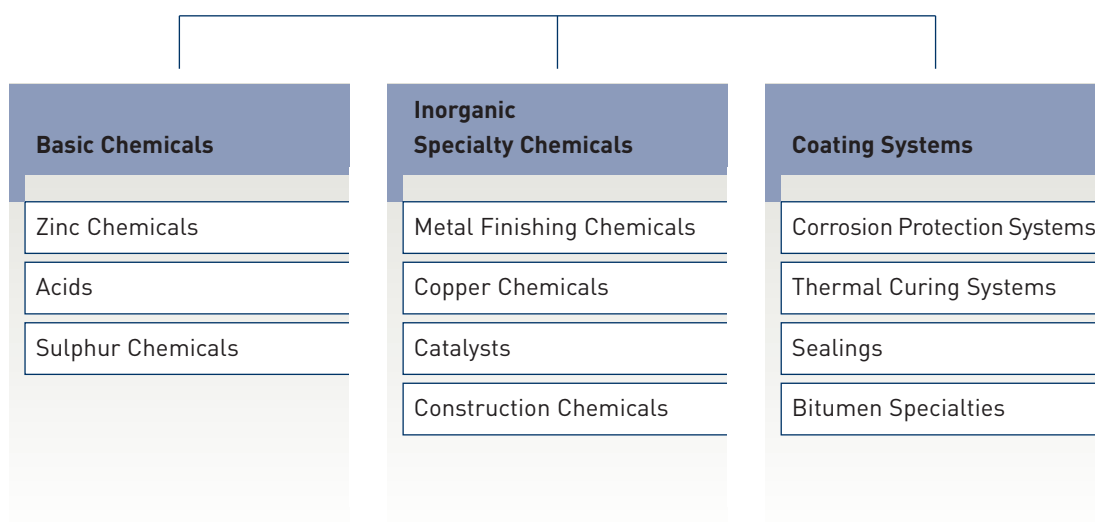


TIB Chemicals successfully passed certification for the standards according to ISO 9001:2000.





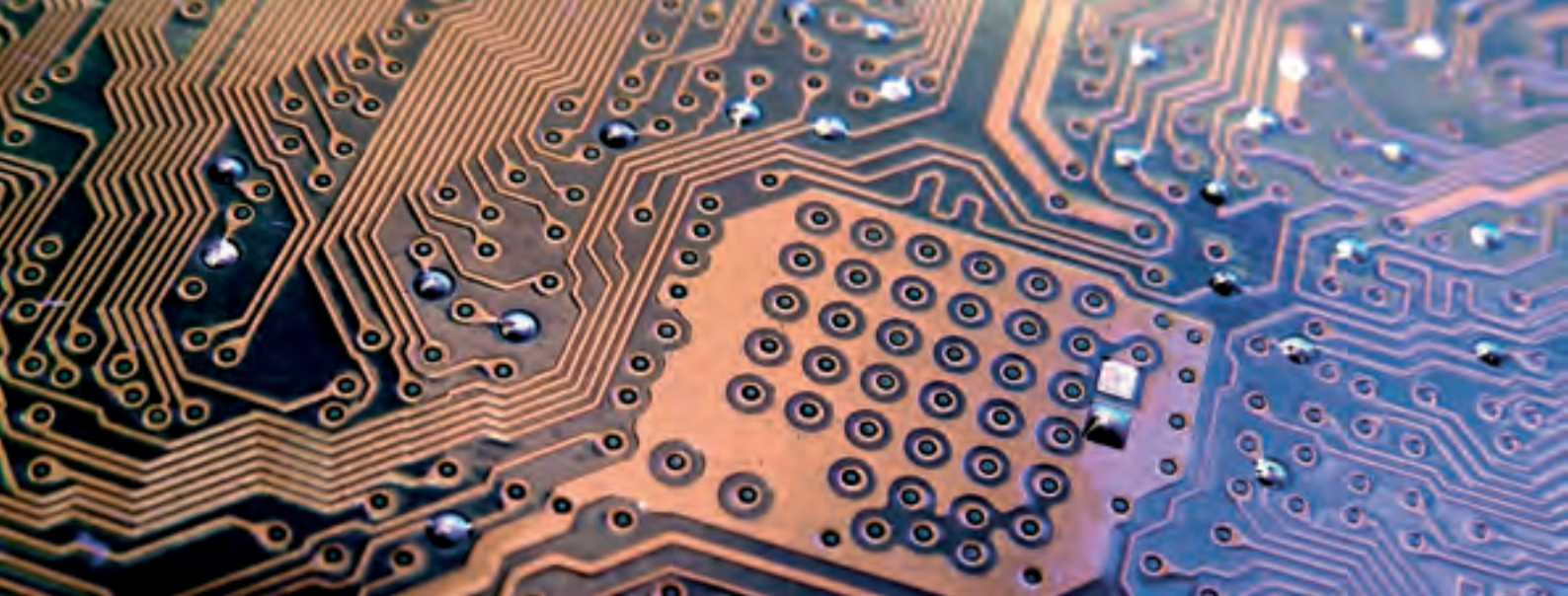
TIB CHEMICALS



The three business units of TIB Chemicals produce and sell:

- ⚡ **Basic Chemicals** such as zinc chemicals, acids or sulphur chemicals, for chemical companies, the metal industry, the hot dip galvanising industry, the electroplating industry, the textile and plastic industries, for water treatment and for the production of food and beverages
- ⚡ **Inorganic Specialty Chemicals** based on the elements tin, zinc, copper and bismuth. These special compounds are used as electroplating chemicals in the electronics and metal industries, as copper chemicals in the automotive and chemical industries, as catalysts in the resin and paint industry, and also in chromate reduction for the construction industry
- ⚡ **Coating Systems** based on two component liquid polyurethane and epoxy systems, which have been developed as anticorrosion protection for the pipeline industry, for the valve-making industry, as well as for sewage outfall, water treatment and power plants. Thermal curing systems for electroplating, tool manufacturing and the packaging industry. Sealing compounds for gas and heating systems. Furthermore, modification and oxidation of bitumen as well as the production of bitumen-based systems for road surfaces

On the following pages, you will find our **Copper Chemicals**.



Intelligent products – for high demands

Our high-quality copper chemicals are used wherever specific requirements have to be met: for example in complex catalysis and synthesis processes or in formulations of sensitive products like propellant mixtures for airbags. Customers of many different branches – manufacturers of copper-containing catalysts, automotive suppliers, vitamin manufacturers, producers of animal feeds and fertilisers, the ceramics industry or the pyrotechnics industry – appreciate the copper compounds manufactured by TIB Chemicals as important additives and base materials: As products of high purity that exactly fulfil the desired specifications.

We have accumulated decades of experience in the production of copper chemicals. Our claim is: to always deliver best-quality products. Every day, our highly educated and experienced employees put this aim into practice, assisted by modern process engineering techniques and an effective quality management system.

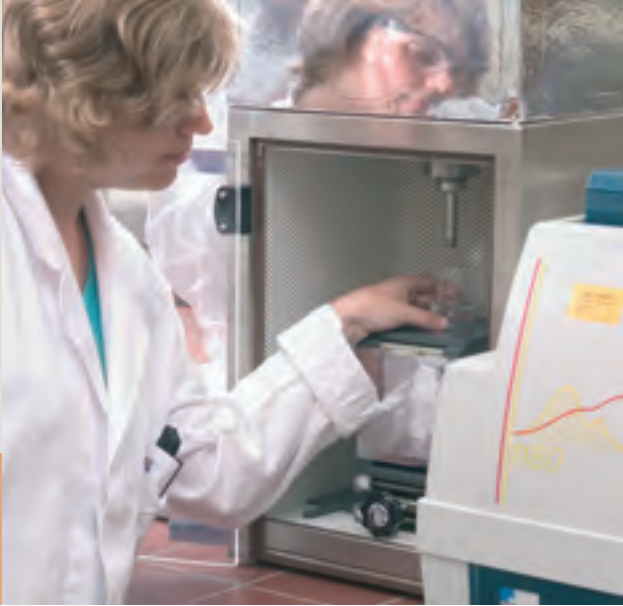
Solid raw material basis – versatile utilisation

A balanced and solid raw material mix provides the basis of our product range: We manufacture copper chemicals for various applications in state-of-the-art plants by using spent copper etching solutions from the electronics industry and pure copper metal in various forms like scrap, swarfs, clippings or granules. We are able to meet even the most unusual requirements of our customers and to manufacture products with very high and specific purity grades, by selective control of our raw materials.

The perfect circulation – disposal of etching solutions and supply of acids

TIB Chemicals is a certified and reliable disposer of spent copper etching solutions. We are equipped with a tank capacity for copper etchants of more than 1000 m³. Our experienced forwarders collect the copper etchants on schedule and in return deliver hydrochloric acid, if requested. This efficient logistics concept saves time, reduces expenses and is environmentally friendly.





Laboratory analytical apparatus

Specific solutions – for individual requirements

Basic Copper Nitrate, Copper(II) Oxide Special ultrafine, Copper(II) Chloride solution, Copper(I) Chloride pearls: Our wide product range provides a suitable solution for nearly all users. And in case the required product with the desired characteristics is not included in the existing portfolio, we will set out to develop it. A rare specification is needed? Or an innovative, environmentally friendly alternative to an essential additive is required? Our highly qualified chemists and laboratory assistants, in close collaboration with our customers, will do everything in their power to develop individual solutions that increase the performance of the envisaged products and that are easily integrated into the respective production processes.

Reliability of supply – also on short notice

We deliver on short notice. Our carefully selected forwarders will take care of this. Just-in-time deliveries can be taken for granted. We guarantee high flexibility – also in the filling type and filling size of our final products. Bags, drums or big bags – our business partners receive the packing that can be integrated most effectively into their production processes.

High-quality technique – for protection of the environment

In the copper chemicals production at Mannheim headquarters, we purify the sewage by using a three-stage ion-selective cation exchanger, thus protecting the environment: Applying this complex treatment, we achieve a sewage copper load of only 0.2–3 mg/l. Regular controls ensure that we remain in compliance with these values.





Propellant components

TIB Chemicals produces speciality chemicals for pyrotechnical inflators. These are customised for the automotive supplying industry and fulfil a wide range of customer specifications. Analytical control of the specification characteristics is carried out on high-quality laboratory equipment, such as the CILAS 1180L for the determination of particle size distribution as well as the Nova 2000e from Quantachrome for evaluation of the specific surface area.

BASIC COPPER NITRATE (BCN)

| CAS-No. | Chemical name | Chemical formula |
|------------|---------------------------------------|---|
| 12158-75-7 | dicopper(II) trihydroxynitrate | Cu₂(OH)₃NO₃ |

Applications

- ∴ in the automotive industry, in pyrotechnical propellant mixtures of inflators for airbags and belt pretensioners
- ∴ as starting product for the manufacture of various catalysts in organic chemistry

Properties

Basic Copper Nitrate (BCN) plays a major role in the development of propellant mixtures of inflators. Over the past years, numerous formulations have been developed in which BCN has a pivotal function as oxygen supplier. TIB Chemicals has been involved in this development since the beginning of the 1990's and has obtained a broad know-how in process technology and chemical engineering for the control of the essential product properties, especially with regard to physical characteristics as, for example, particle size, surface structure or bulk density. As these characteristics have a central function in the automotive industry, we developed two product types that vary mainly in their bulk density.

Types

- ∴ Basic Copper Nitrate uncompact
BCN with a bulk density of < 0.5 g/cm³
- ∴ Basic Copper Nitrate compacted
This is an additionally compressed or compacted BCN with a bulk density of > 0.5 g/cm³



Our speciality chemicals play a significant role in propellant formulations of the automotive supplying industry

COPPER(II) OXIDE SPECIAL ULTRAFINE

| CAS-No. | Chemical name | Chemical formula |
|-----------|------------------|------------------|
| 1317-38-0 | copper(II) oxide | CuO |

Applications

- ⚡ in the automotive industry, in pyrotechnical propellant mixtures of inflators for airbags and belt pretensioners
- ⚡ in heterogeneous catalysis
- ⚡ as starting product for the manufacture of other copper compounds

Properties

We developed Copper(II) Oxide Special ultrafine for pyrotechnical inflators in combination with BCN. Copper(II) Oxide Special ultrafine is responsible for the preferably entire burnout of the kindled mixture in the propellants of inflators. Copper(II) Oxide Special ultrafine also has special physical properties such as a higher specific surface (> 8 m²/g) for better catalytical reactions and a fine particle size (98 % < 25 μm).

Types

- ⚡ Copper(II) Oxide Special ultrafine BET > 8 m²/g
- ⚡ Copper(II) Oxide Special ultrafine 30 BET > 25 m²/g

COPPER(II) HYDROXIDE SPECIAL


| CAS-No. | Chemical name | Chemical formula |
|------------|----------------------|---------------------|
| 20427-59-2 | copper(II) hydroxide | Cu(OH) ₂ |

Applications

- ⚡ in the automotive industry, in pyrotechnical propellant mixtures of inflators for airbags and belt pretensioners
- ⚡ in heterogeneous catalysis
- ⚡ suitable as copper source for organic syntheses and formulations due to fast dissolving speed in acids

Properties

Copper(II) Hydroxide Special was developed especially for processes aiming at a high catalytical impact. This is achieved by its high specific surface area of > 75 m²/g. It can be used as final product in propellant mixtures, especially in the field of airbag chemicals.



Copper Carbonate of TIB Chemicals is extremely free flowing due to its high bulk density

Process chemicals

TIB Chemicals offers a wide range of copper products which, due to their high quality, are highly appreciated for use as additives and base materials in formulations for many different industrial sectors. Our copper compounds, also named inorganic copper salts, are used in a multitude of different catalysis and synthesis processes. In addition to our copper salts, we offer copper chloride, copper nitrate and copper sulphate solutions.

COPPER(II) ACETATE

| CAS-No. | Chemical name | Chemical formula |
|-----------|--------------------------------|--|
| 6046-93-1 | copper(II) acetate monohydrate | $\text{Cu}(\text{CH}_3\text{COO})_2 \times \text{H}_2\text{O}$ |

Applications

- ⚡ as starting product for the manufacture of other copper compounds
- ⚡ as catalyst for oxidation, hydrogenation, esterification, polymerisation and other chemical reactions in inorganic chemistry
- ⚡ as intermediate for the manufacture of colour pigments, for example "Schweinfurt Green"
- ⚡ for the formulation of fungicides and bactericides
- ⚡ for dyeing of textiles
- ⚡ for the production of vitamins
- ⚡ in the rubber industry

Properties

Copper Acetate is the copper salt of acetic acid, and is also specified as verdigris. It contains approx. 32 % of copper and crystallises with 1 mol crystal water. It shows good solubility in water; solubility in alcohol is a bit lower.



Copper Carbonate for activated carbon filters in respiratory protection techniques

COPPER CARBONATE

| CAS-No. | Chemical name | Chemical formula |
|------------|------------------------------------|---|
| 12069-69-1 | copper(II) hydroxycarbonate | $\text{Cu}(\text{OH})_2 \times \text{CuCO}_3$ |

Applications

- ⚡ as starting product for the manufacture of various catalysts in organic chemistry
- ⚡ as starting product for the manufacture of other copper compounds, for example copper(II) oxide (thermal processing), copper citrate, copper acetate
- ⚡ for wood preservation (impregnation solutions)
- ⚡ for dyeing of ceramics
- ⚡ as pigment in paper production
- ⚡ in pyrotechnics
- ⚡ for respiratory protection techniques

Properties

Our dry Copper Carbonate with a copper content of approx. 55 % is a fine, light-green powder with a relatively high bulk density ($> 1.5 \text{ g/cm}^3$). It is extremely free flowing, does not form lumps or agglomerates and is insoluble in water. Alternatively, we offer a wet Copper Carbonate with a moisture content of 11–16 %. This product is dark green and, despite the high water content, is still free flowing.



Dyed ceramics



Impregnation solutions for wood preservation



Copper(II) Chloride as preliminary product for the production of vitamins and for the pigment and dyeing industry

COPPER(I) CHLORIDE PEARLS

| CAS-No. | Chemical name | Chemical formula |
|------------------|---------------------------|------------------|
| 7758-89-6 | copper(I) chloride | CuCl |

Applications

- ⚡ in Mueller-Rochow synthesis
- ⚡ as raw material for the synthesis of copper-phthalocyanine pigments
- ⚡ as catalyst for various reactions in organic chemistry
- ⚡ for the Sandmeyer reaction

Properties

CuCl consists of fine grey-black pearls with an average particle size of approx. 100–200 µm. The copper content is around 64 %. Copper(I) Chloride is a highly hygroscopic product.

COPPER(II) CHLORIDE

| CAS-No. | Chemical name | Chemical formula |
|------------------|----------------------------|-------------------------|
| 7447-39-4 | copper(II) chloride | CuCl₂ |

Applications

- ⚡ for the manufacture of various catalysts in organic chemistry
- ⚡ as catalyst (in organic synthesis for chlorination and/or oxidation, in catalytic processes)
- ⚡ in the electronics industry
- ⚡ in the pigment and dyeing industry
- ⚡ for pyrotechnics to generate green flames
- ⚡ for production of vitamins
- ⚡ for the pickling of brass

Types

- ⚡ Copper(II) Chloride Dihydrate (CuCl₂ x 2H₂O) consists of blue-green crystals, is soluble in water and has a copper content of approx. 37 %.
- ⚡ Copper(II) Chloride Anhydrous (CuCl₂) is a brown crystal powder. It is soluble in water and highly hygroscopic. The copper content is around 47 %.
- ⚡ Copper(II) Chloride solution
Alternatively, we offer Copper(II) Chloride as solution. In this form, we can deliver various copper concentrations, according to the requirements of our customers. The actual availability varies from standard concentrations of approx. 15 % of copper to copper contents of more than 19 %.



Copper-containing formulations
for crop protection

COPPER(II) CITRATE

| CAS-No. | Chemical name | Chemical formula |
|----------|---|---------------------------------|
| 866-82-0 | 2-hydroxy-1,2,3-propanetricarboxylic acid copper salt | $C_6H_4Cu_2O_7 \times 1.5 H_2O$ |

Applications

- ⚡ as algicide (swimming pools)
- ⚡ as antiseptic agent
- ⚡ in metal treatment lubricants
- ⚡ in wine agitation to avoid the so-called wine errors ("Böckser")

Properties

Copper(II) Citrate is a light-blue powder. It is hardly soluble in water but better soluble in diluted acids and ammonium solutions. The copper content is around 37 %.

COPPER(II) HYDROXIDE

| CAS-No. | Chemical name | Chemical formula |
|------------|----------------------|------------------|
| 20427-59-2 | copper(II) hydroxide | $Cu(OH)_2$ |

Applications

- ⚡ as starting product for the manufacture of other copper compounds, like copper naphthenate
- ⚡ as pesticides
- ⚡ in heterogeneous catalysis
- ⚡ for the manufacture of copper silk
- ⚡ for the manufacture of mordants and ship bottom paints

Properties

Copper(II) Hydroxide is a light-blue powder, insoluble in water. The copper content is approx. 64 %. At temperatures of 60–80 °C, dehydration and formation of Copper(II) Oxide occur.



Copper Nitrate and Copper Chloride solutions are available in different concentrations

COPPER(II) NITRATE

| CAS-No. | Chemical name | Chemical formula |
|-----------|--------------------|----------------------------|
| 3251-23-8 | copper(II) nitrate | $\text{Cu}(\text{NO}_3)_2$ |

Applications

- :: as starting product for the manufacture of other copper compounds
- :: as starting product for the manufacture of various catalysts in organic chemistry
- :: for dyeing of metals
- :: for dyeing of textiles
- :: for the formulation of fungicides and herbicides

Properties

Copper(II) Nitrate Trihydrate is a technical crystalline product ($\text{Cu}(\text{NO}_3)_2 \times 3\text{H}_2\text{O}$) with a copper content of around 26 %, consisting of big blue-green, deliquescent, orthorhombic crystals. Alternatively, we can offer Copper Nitrate solutions. The standard solution is manufactured at a copper content of approx. 15 %; higher concentrations are available upon request. We have a huge production capacity for this product due to our own high demand for copper nitrate solution as starting product for other copper compounds.

Types

- :: Copper(II) Nitrate Trihydrate
- :: Copper Nitrate solution

COPPER(II) OXYCHLORIDE

| CAS-No. | Chemical name | Chemical formula |
|-----------|------------------------|--|
| 1332-65-6 | copper(II) oxychloride | $\text{CuCl}_2 \times 3\text{Cu}(\text{OH})_2$ |

Applications

- :: as starting product for the manufacture of various other copper compounds
- :: for the formulation of fungicides, herbicides and insecticides
- :: for the manufacture of various catalysts in organic chemistry
- :: as catalyst (in organic synthesis for chlorination and/or oxidation)

Properties

Copper Oxychloride is a fine, light-green powder with a copper content of approx. 57 %. It is insoluble in water, but soluble in various acids.



Copper(II) Oxide
in various fields
of application

COPPER(II) OXIDE

| CAS-No. | Chemical name | Chemical formula |
|-----------|------------------|------------------|
| 1317-38-0 | copper(II) oxide | CuO |

Applications

- as starting product for the manufacture of other copper compounds
- as coloured pigment in glazes for glassware, ceramics and enamel
- in pyrotechnics
- as catalyst and for the manufacture of various catalysts in organic chemistry
- in the rubber industry

Properties

Copper(II) Oxide is a fine black powder. It is insoluble in water and alcohol but soluble in diluted acids. TIB Chemicals offers various types of Copper(II) Oxide.

Types

- Copper(II) Oxide
Available are copper oxides with a copper content of around 78 %. They can be mainly classified by their different production processes (thermal or precipitation process), or by their different bulk densities (heavy CuO with approx. 2.4 g/cm³; light material with approx. 1.8 g/cm³)
- Copper(II) Oxide HSSA (high specific surface area)
A special product with a minimum copper content of 73 % and a specific surface area (BET) of minimum 60 m²/g. Copper(II) Oxide HSSA features a very high surface area for this chemical compound and is therefore especially suitable for heterogeneous catalysis

TIB Chemicals offers another Copper(II) Oxide grade (EPG=electroplating grade) especially for metal finishing applications. For more detailed information please get in touch with our Metal Finishing Chemicals department. Details are provided in the brochure "Metal Finishing Chemicals".

Copper chemicals in
textile dyeing



COPPER(II) SULPHATE

| CAS-No. | Chemical name | Chemical formula |
|-----------|----------------------------------|-------------------|
| 7758-99-8 | copper(II) sulphate pentahydrate | CuSO ₄ |

Applications

- ❑ as starting product for the manufacture of other copper compounds
- ❑ for the formulation of fungicides and algicides
- ❑ as supplement in animal feeds
- ❑ as fertiliser
- ❑ for aftertreatment in dyeing works
- ❑ as catalyst and for the manufacture of various catalysts in organic chemistry

Properties

Copper(II) Sulphate Pentahydrate is a blue crystalline product with a copper content of approx. 25 %. It is easily soluble in water, but insoluble in most organic solvents.

TIB Chemicals also offers a Copper Sulphate solution (EPG = electroplating grade) especially designed for metal finishing applications. For more detailed information please get in touch with our Metal Finishing Chemicals department. Details are provided in the brochure "Metal Finishing Chemicals".



Copper(II) Sulphate as fertiliser ...



... and as supplement in animal feeds



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