TIB CHEMICALS

BASIC CHEMICALS | INORGANIC SPECIALTY CHEMICALS | COATING SYSTEMS

Sulphur Chemicals I specific and versatile

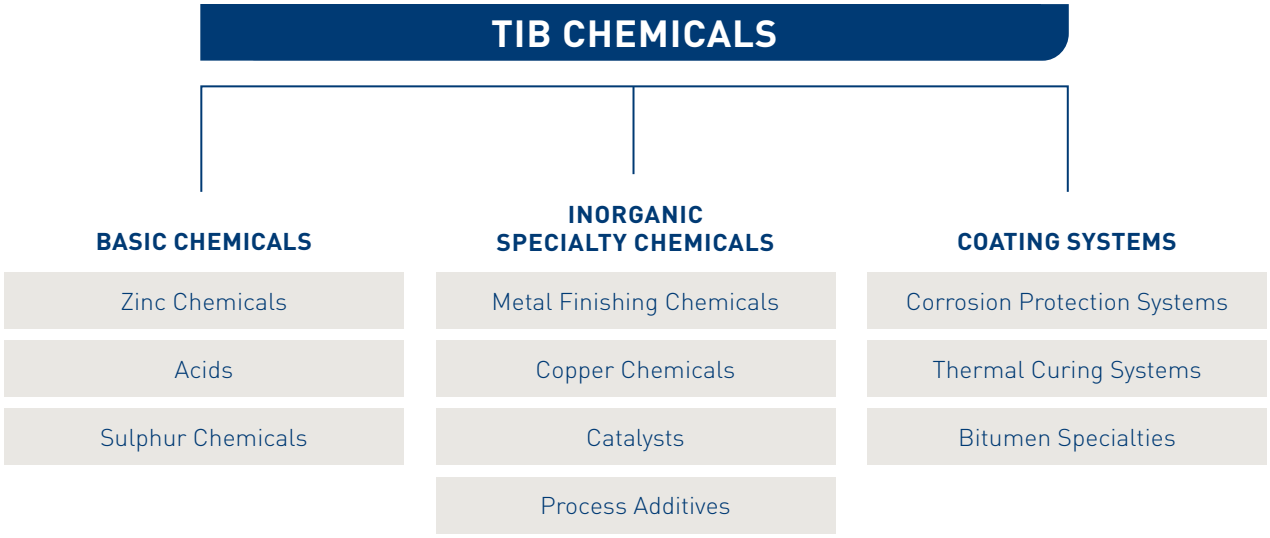
LEADERS IN QUALITY AND SERVICE

TIB Chemicals was born following the merger of Goldschmidt TIB of Germany and Goldschmidt Química de México. The nickel chemicals specialist Königswarter & Ebell joined the TIB Chemicals Group in 2010. The company is a leading international supplier of a wide range of basic chemicals, innovative inorganic specialty chemicals and high-performance coating systems.

The largest production facilities are located in Mannheim and Hagen, Germany and San Luis Potosí, México. Our sales and distribution organisation operates worldwide. TIB Chemicals has more than 350 highly qualified employees who draw on the company's over 130 years of experience and accumulated expertise. Currently they produce and process more than 400,000 tonnes of chemicals and generate revenues of about 150 million euros a year, with an accelerating trend.

For years, the growth of TIB Chemicals has outpaced the industry average. Our success is based on the highquality products and tailor-made solutions we develop for our customers, backed by a flexible logistics service. We are committed to supporting our customers and helping them to achieve business success.

The company is divided into three business units: Basic Chemicals, Inorganic Specialty Chemicals and Coating Systems. All three act flexibly and quickly to meet our customers' wishes and needs. Together they form a strong unit with a solid financial base and the logistical and organisational structure of a large corporation.



THE THREE BUSINESS UNITS OF TIB CHEMICALS

BASIC CHEMICALS

Such as zinc compounds, acids and sulphur compounds for chemicals companies, the metal industry, the hot dip galvanising industry and the plastics industry. Our basic chemicals are also used in the preparation of fertilisers and in the food processing and oil industries.

INORGANIC SPECIALTY CHEMICALS

Based on the elements tin, zinc, copper, nickel, bismuth and chrome. These special compounds are used for various purposes in today's high-tech industries. Target markets include electroplating chemicals, automotive, catalysts for coatings and process additives for chemistry, ceramics and building materials.

COATING SYSTEMS

Based on two-component liquid polyurethane and epoxy systems, serve as anticorrosion protection for the pipeline and valve manufacturing industry, as well as for water treatment and power plants. In the area of thermal curing systems, we produce dip coatings for the electroplating and tool industries, as well as stoving varnishes for the packaging industry. Bitumen specialties find their application in civil engineering and traffic areas.

Our **Sulphur Chemicals** are presented on the following pages.

SPECIFIC AND VERSATILE

Our sulphur chemicals plant produces a large variety of products in various versions for a multitude of applications. Our product range includes additives for fertilizers, for the crude oil industry, for foods as well as raw materials for the leather manufacturing and products for photo processing.

Within this variety, TIB Chemicals offers high-quality standard products as well as customized solutions. On request, we support our business partners' product development to find the most suitable solution for their manufacturing process.

HIGH GRADE, COMPETITIVE AND FLEXIBLE

Our products are of a consistent first-class quality. Accurate regular analysis according to industry norms or individual specifications are our daily business. We are supported in this by continuous improvements of our processes, as well as short decision-making paths within our company to remain competitive.

Whether complete tanker trucks or trial quantities, all our deliveries are carried out according to our customers' demands. We also react quickly and flexibly to urgent delivery requests. Our reaction time benefits from our short manufacturing lead-time as well as from our suitable expanded dispatch facilities.

OUR PRODUCTS FOR THE FERTILIZER INDUSTRY

ATS – THE PLUS FOR EFFECTIVE FERTILIZATION

Ammonium Thiosulphate (ATS) is an additive used for the manufacturing of liquid fertilizers. It contains the highest possible sulphur content and can be blended in almost all proportions with other fertilizers and pesticides.

ATS delays Urea decomposition by 50 %. This ensures that the evaporation of Ammonia is slow and the plant can absorb more nitrogen.

ATS acts immediately but also has long-term effects. During fertilization, for example when spraying the product, a proportion of ATS is oxidized by the air and becomes Ammonia sulphate. The sulphate can be absorbed by the plant in a very short time. The remaining ATS is oxidized in the soil and supplies the plant over a longer period with the sulphate's sulphur.

When mixed with Urea, ATS is especially suitable for the fertilization of rape, cereals, sugar beet and grassland. Applications in other cultures (e. g. potatoes and corn) is also possible.

Characteristics:

Nitrogen content (N):	approx. 12 %
Sulphur content (S):	approx. 26 %

AGRO N FLUID – THE NUTRITIONAL SUBSTANCE FOR FRUITS AND VEGETABLES

Agro N Fluid is a highly efficient water-soluble nitrogen fertilizer for fruit growing and agriculture. Depending on the fruit grade and the bloom strength, it is applied from the beginning of flowering until maximum flowering is achieved.

The solution can be sprayed very quick and easily, resulting in optimal results and considerable time saving.

Applied in agriculture (cereals, corn, rape, potatoes) the particular sulphur formulation of Agro N Fluid ensures ideal and fast absorption by the plant.

Characteristics:

ATS content:	52 %-53 %
Total Nitrogen content (N):	approx. 15 %
Sulphur content (S):	approx. 22 %

Please contact us or our distribution partner for further information about the best spraying time and optimum quantities:

Proagro GmbH
Beerbach 55
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www.proagro-gmbh.de

POTASSIUM THIOSULPHATE – FOR SELECTIVE GROWTH

Because plants cannot decompose the potassium silicates available in the soil, it is essential to supply them with potassium via fertilizer to avoid a potassium deficit. **Potassium Thiosulphate** strengthens wood formation and plant statics. In addition, it improves the water absorption of the plant cells. This is essential especially during periods of rapid plant growth or during fruit formation.

Potassium Thiosulphate is further used for fertilization of chloride-sensitive plants e. g. viniculture.

Characteristics:

$K_2S_2O_3$ content:	48.5 %-51.5 %
Potassium as K_2O:	approx. 25 %
Total sulphur (S):	approx. 17 %

SULPHURIC ACID – AN ESSENTIAL COMPONENT FOR THE MANUFACTURING OF FERTILIZERS

The bulk of sulphuric acid production is used for the manufacture of fertilizers.

Mainly Phosphate fertilizers and ammonium sulphate are manufactured using sulphuric acid. Ammonium sulphate originates from the reaction of half-concentrated sulphuric acid with ammonia. For the manufacture of phosphate fertilizers, sulphuric acid is used for the decomposition of the untreated phosphate.

OUR PRODUCTS FOR THE FOOD INDUSTRY

Whether for the manufacturing of caramel colour, converting sugar beets, wine production or conservation: our products lead to efficient working processes as well as optimum results for our customers.

Our products are distinguished by consistent high quality. This is achieved due to our demand for top quality raw ingredients as well as through our extensive production experience.

Typical applications:

- as catalysts for the manufacture of the food colorant E 150d
- as colour stabilizers for converting sugar beets
- in starch production
- as antioxidant and conservation agents
- as yeast nutrients for wine production
- as acid regulators and stabilization agents
- as vehicle and a substitute for salt

Products and their characteristics:

Ammonium Hydrogensulphite solution approx. 70 %
Ammonium Bisulphite (ABS)

NH_4HSO_3 content:	68 %-72 %
SO_2 content:	42 %-47 %

Ammonium Sulphite solution approx. 35 %

$(NH_4)_2SO_3$ content:	33 %-40 %
SO_2 content:	18.5 %-22 %

Potassium Sulphite solution approx. 45 %

K_2SO_3 content:	44.5 %-45.5 %

Sodium Hydrogensulphite solution 38 %-40 %
Sodium Bisulphite (SBS)

$NaHSO_3$ content:	38 %-40 %
SO_2 content:	23 %-26 %

Sodium Metabisulphite – technical and food grade

$Na_2S_2O_5$ content:	min. 97.2 %

Sodium Sulphite – technical and food grade

Na_2SO_3 content:	min. 98 %

OUR PRODUCTS FOR THE CRUDE OIL INDUSTRY

Ammonium Hydrogensulphite (ABS) and Sodium Hydrogensulphite (SBS) provide effective protection against corrosion during offshore oil drilling. Both products bind the oxygen of the inserted drilling fluids (e. g. brine) in an harmless chemical reaction. Thereby the corrosion effect is significantly reduced (Redox-reaction). Consequence: Corrosion is prevented.

Products and their characteristics:

Ammonium Hydrogensulphite solution approx. 70 %
Ammonium Bisulphite (ABS)

NH_4HSO_3 content:	68 %-72 %
SO_2 content:	42 %-47 %

Sodium Hydrogensulphite solution 38 %-40 %
Sodium Bisulphite (SBS)

$NaHSO_3$ content:	38 %-40 %
SO_2 content:	23 %-26 %

Upon request, we can produce both products in different concentrations or as catalyzed versions with added nickel or cobalt.

TIB Stim is an effective reduction agent for the removal of metallic contaminants, which can build up in pipes due to corrosion and constrict oil extraction (Iron(III) reduction). TIB Stim is completely soluble and also remains stable at high temperatures and high acid concentrations.

Characteristics:

Stannous chloride

$SnCl_2$ *2 H_2O content:	49 %-52 %

OUR PRODUCTS FOR PHOTO PROCESSING

Our sulphur chemicals allow fast fixing of all photographic images, regardless of whether the images are colour or black & white or if they are developed manually or automatically.

Colour films, photographic papers, reproductions or X-ray films: established since decades, TIB Chemicals' products are essential for every process.

Products and their characteristics:

Ammonium Hydrogensulphite solution approx. 70 %
Ammonium Bisulphite (ABS)

NH_4HSO_3 content:	68 %-72 %
SO_2 content:	42 %-47 %

Ammonium Sulphite solution approx. 35 %

$(NH_4)_2SO_3$ content:	33 %-40 %
SO_2 content:	18.5 %-22 %

Ammonium Thiosulphate solution approx. 60 % (ATS)

$(NH_4)_2S_2O_3$ content:	58 %-61 %

Ammonium Thiosulphate crystals 98 %/100 %

$(NH_4)_2S_2O_3$ content:	96.5 %-98.5 %
$Na_2S_2O_3$ content:	1 %-3 %

ATS 80/20

$(NH_4)_2S_2O_3$ content:	78 %-82 %
$Na_2S_2O_3$ content:	18.5 %-21.5 %

ATS 90/10

$(NH_4)_2S_2O_3$ content:	88 %-92 %
$Na_2S_2O_3$ content:	8 %-12 %

Fixing salt

$(NH_4)_2S_2O_3$ content:	74 %-78 %
$Na_2S_2O_3$ content:	4 %-6 %
$Na_2S_2O_5$ content:	16 %-21 %

Potassium Sulphite solution approx. 45 %

K_2SO_3 content:	44.5 %-45.5 %

Potassium Thiosulphate solution approx. 50 %

$K_2S_2O_3$ content:	48.5 %-51.5 %

Sodium Thiosulphate crystals

$Na_2S_2O_3$ *5 H_2O:	min. 99 %

Sodium Thiosulphate anhydrous

$Na_2S_2O_3$ content:	min. 98 %

TIB Chrome 22 (2,2'-Ethylene-dithio-diethanol)

$C_6H_{14}O_2S_2$ content:	min. 99 %

OUR PRODUCTS FOR LEATHER MANUFACTURING

Our sulphides are indispensable ingredients for the manufacturing of high-quality leather. They shorten the depilation and swelling process without any harmful effects on leather quality. Both the suppleness and the original texture of the leather are maintained.

Products and their characteristics:

Sodium Sulphide flakes

Na_2S content:	60 %-62 %

Sodium Hydrogensulphide flakes

NaHS content:	70 %-72 %

Unifyl B gives the leather a soft amplitude during the tanning process, good rotundity and soft grip.

The leather becomes homogeneous and lends itself better to processing. Unifyl B is a filler similar to protein, which is used mainly for the tanning of soft leather but also for chromate, vegetable and combined tanning of leather.

Our **Unislip** product avoids adhesion or ripping of the skins during processing. The working bins can be filled with up to 20 % more skins without the risk of cracks or pleats. Unislip improves the leather's tendency to slide and achieves a higher evenness during the tanning process. Unislip is well soluble in water and can easily be washed out. In addition, it has high compatibility.

OUR PRODUCTS FOR THE TIMBER AND FIBRE INDUSTRY

Formaldehyde emissions can be verifiably decreased with **TIB ABSorb**. TIB ABSorb acts as a formaldehyde scavenger in adhesive agents, derived timber and fibreglass products.

Applied as an additive, TIB ABSorb reduces excessive formaldehyde from your processes and inhibits retroactive emissions from the end product. Due to its high reduction potential, TIB ABSorb is much more efficient than traditional formaldehyde scavengers.

Our products support you in achieving and even exceeding the most actual emissions limits.

Products and their characteristics:

Ammonium Hydrogensulphite solution approx. 70 %
Ammonium Bisulphite (ABS)

NH_4HSO_3 content:	68 %-72 %
SO_2 content:	42 %-47 %

Ammonium Sulphite solution approx. 35 %

$(NH_4)_2SO_3$ content:	33 %-40 %
SO_2 content:	18.5 %-22 %

FURTHER TYPICAL APPLICATIONS OF OUR SULPHUR CHEMICALS

Ammonium Hydrogensulphite solution approx. 70 %
Ammonium Bisulphite (ABS) – NH_4HSO_3

- as a decomposition agent for fibre production
- as a bleaching agent in the paper and pulp industry
- as a reducing agent for keratin
- as a preservative agent in the cosmetics industry
- as an additive for medical products
- for the Redox polymerization of vinyl compounds

Ammonium Sulphite solution approx. 35 % – $(NH_4)_2SO_3$

- as a bleaching agent in the paper and pulp industry
- as a wood decomposition agent
- as a reducing agent in the chemical industry
- as a preservative agent in the cosmetics industry

Ammonium sulphide solution 40 %-48 % – $(NH_4)_2S$

- as a catalyst in chemical production plants
- for analysis purposes in the laboratory

Ammonium Thiosulfate crystals 96 %/100 % and 98 %/100 %

Ammonium Thiosulfate solution approx. 60 % – $(NH_4)_2S_2O_3$

- for the recycling of silver

Potassium Sulphite solution approx. 45 % – K_2SO_3

- for the production of herbicides

Potassium Thiosulphate solution approx. 50 % – $K_2S_2O_3$

Sodium Hydrogensulphide flakes 70 % /72 %

Sodium Hydrogensulphide solution 30 %-45 % – NaHS

- for the production of thioglycolic acid
- for ore flotation processes
- as a reduction agent (e. g. for the colouring of textiles)
- for wastewater treatment (precipitation of heavy metals)
- for the production of luminous pigments

Sodium Hydrogensulphite solution 38 %-40 % – Sodium Bisulphite (NBS) – $NaHSO_3$

- for fibre production
- as a bleaching agent in the paper and pulp industry
- for the decomposition of raw materials
- as a reduction agent for wastewater treatment
- for the manufacture of fabric conditioners

Sodium Sulphide flakes 60 %/62 % – Na_2S

- for the manufacture of sulphur-based colours and pigments in the colouring industry
- for the manufacture of titanium dioxide
- for wastewater treatment (precipitation of heavy metals)
- for the elimination of organic mercury compounds in wastewater
- for ore flotation processes
- as a reduction agent (e. g. for the colouring of textiles)

Sodium Metabisulphite – technical and food grade – $Na_2S_2O_5$

- as a reduction agent for the production of chemical fibres

Sodium Sulphite – technical and food grade – Na_2SO_3

- as an oxidation protection for developers

Sodium Tetrasulphide solution approx. 40 % – Na_2S_4

- for the manufacture of sulphur-based colours
- for the manufacture of lubricants
- as a flotation agent
- for wastewater and sludge treatment
- for the removal of metals (e. g. mercury) from flue gases
- for metal colouring
- as an antioxidant
- for cleaning galvanic baths

Sodium Thiosulphate crystals – $Na_2S_2O_3*5\ H_2O$
Sodium Thiosulphate anhydrous – $Na_2S_2O_3$

- for de-chlorination in wastewater treatment (neutralization of chlorine)
- for the manufacture of bath salts
- for the extraction of silver chloride from silver ore
- for the manufacture of gold and silver baths (plating industry)

Hydrochloric acid 30 %-33 % – HCl

- as an auxiliary material in the chemical industry
- for the regeneration of ion exchangers (e. g. water treatment in power plants)
- for adjusting pH values and neutralisation
- for etching and cleaning of metals
- for the exploitation of metal chlorides
- as a decomposition agent (e. g. in the agricultural and food industry)

Sulphuric acid 10 %-99 % – H_2SO_4

- for the manufacture of salts e. g. ammonium sulphate or manganese sulphate
- as a decomposition agent for the manufacture of zinc and titanium dioxide
- for the manufacture of acids e. g. hydrofluoric, phosphoric, citric and lactic acid
- as battery acid in e. g. lead accumulators
- as an electrolyte in electrolytic processes
- for sulphonation during tensides processing
- for the manufacture of colorants
- in metal processing for etching, cleaning and descaling, as well as for the yellow tinting of brass
- for rubber vulcanisation
- for the refining and cleaning of lubricants in the petroleum industry
- for gas cleaning in gas and coking plants
- for the manufacture of technical silicates
- in the chemical industry e. g. for adjusting pH values and as catalyst

TIB Chrome 22 – 2,2'-Ethylene-dithio-diethanol – $C_6H_{14}O_2S_2$

- as so-called 'catalyst poison' in vitamines production
- for the complexation of silver
- for the recycling of silver

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