Industry

Premium Raw Materials for Industrial Applications

The Authority in Potassium and Magnesium

K+S KALI GmbH – The Authority in Potassium and Magnesium

K+S KALI GmbH are an international company and a global partner in potassium and magnesium products. Our products are used in many technical, industrial, pharmaceutical and cosmetic applications.

Mineral salts are contained in a great number of personal hygiene and beauty care products. Our potassium and magnesium products are of natural origin. They were deposited at great depths, more than 200 million years ago and are devoid of anthropogenic influences.


ZERTIFIKAT
TÜV

Service & Quality Management

Quality awareness has always been a key element of our corporate culture. Based on DIN EN ISO 9001:2000, K+S KALI GmbH have established a Quality Management System which, among other objectives, guarantees continuous monitoring and improvement of our product and service quality.

Within K+S KALI GmbH, Quality Management is a leadership function throughout all levels of responsibility and includes each employee at his or her place of work. The basic principle is the prevention of problems rather than retrospective cures.

All the products within the “Industrial Salts“ sector, as well as different departmental functions and processes that are in place to service our customers, have been certified in accordance with DIN EN ISO 9001:2000.

Potassium and Magnesium Salts for the Industry

A Wide Range of Products for Industry

K+S KALI GmbH offer an extensive range of high-grade potassium and magnesium products for industrial applications. These products are available in several grades and in parts special particle size distributions.

Premium Raw Materials for Premium Products

State-of-the-art process controls and extensive Quality Management guarantees compliance with industrial standards. Our products are therefore an important contribution to Quality Assurance throughout industrial applications and in the resulting end products.

K+S KALI GmbH – A Partner to Many Branches

Its extensive portfolio of industrial salts ensures K+S KALI GmbH are the right partner to many different industries – from oil production to electrolysis. Our experts for the industrial sector would be happy to provide further product information and advice on application areas.

Application Areas

Special potassium and magnesium compounds are indispensable raw and auxiliary materials throughout many industrial processes – such as the production of synthetic materials or detergents.

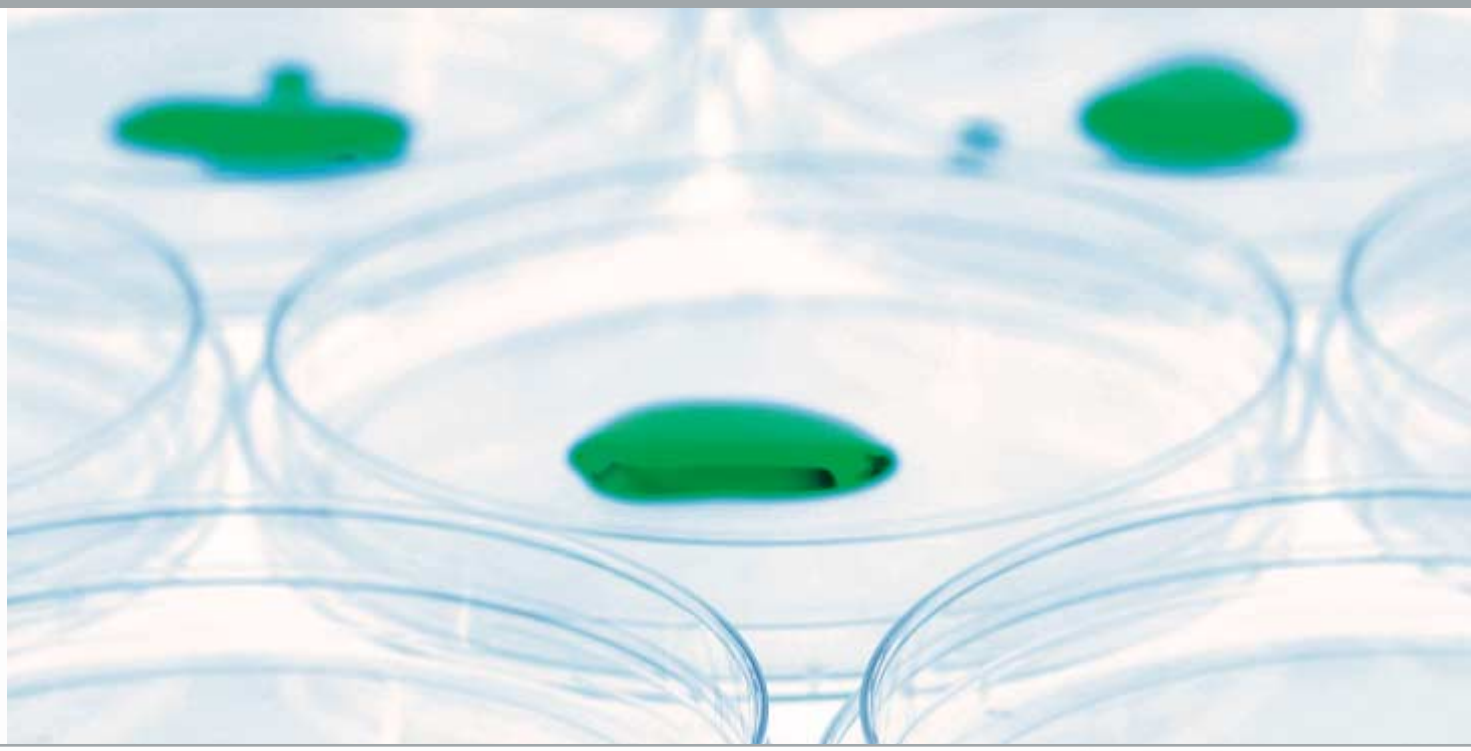
Here we would like to provide an overview of the most important areas of application for our potassium and magnesium products in the processing industry.

For more information on K+S KALI GmbH products and their applications, please feel free to contact us.

Biotechnology

High purity grades of magnesium sulphate (epsom salt), potassium chloride and potassium sulphate are used in biotechnology, as nutrients for micro-organisms.

Typical processes are yeast production, as well as fermentation reactions for the production of proteins, enzymes, ethanol, vitamins etc..



Cellulose Production

Raw cellulose produced by the Kraft Process still contains residual lignin, which is responsible for the brown colour of unbleached pulp. Subsequent procedural steps minimise residual lignin to a large extent by oxidation of the chromophorous groups.

Oxygen delignification is the standard procedure in preparation for the subsequent bleaching sequence. In comparison to other chemicals, oxygen shows clear advantages; however, it shows poor reaction selectivity, and causes partial degradation of the cellulose fibres.

Magnesium sulphate has been successfully used as an additive in order to stabilise the cellulose during oxygen delignification. It is also beneficial in alkaline bleaching stages, in which hydrogen peroxide is used.

Detergent Production

Heavy-duty detergents mostly contain bleaching agents in order to decolourise stains caused by things like fruit juices or red wine. Mainly perborates are used here. However, particularly in the presence of traces of heavy metals, they exhibit a tendency to uncontrolled and fast decomposition, while releasing oxygen. This inactivation of the perborates is inhibited by adding stabilisers.

Magnesium sulphate and its derivative, magnesium silicate, are used as stabilisers. They are gentle on fibres and the environment.

Magnesium sulphate is also used in liquid soaps, laundry and dish washing detergents to regulate viscosity.

Dust Binding

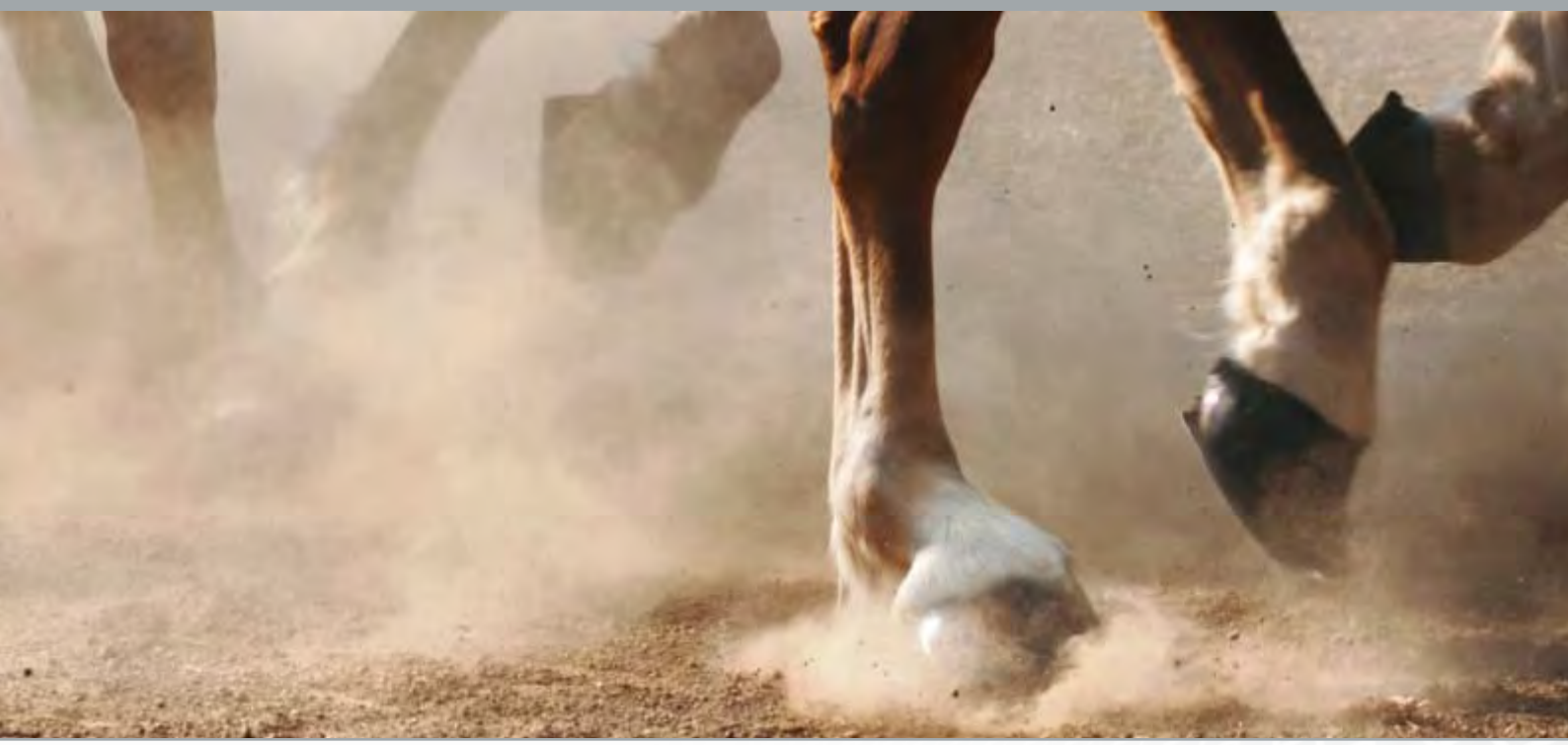
Mining

Most mining processes produce a lot of fine-grained dust which is light enough to be carried in the air and can cause loose deposits on ridges and faces. It is easily dispersed, and in case of ignition may result in dangerous explosions.

Dust binding agents using hygroscopic salts in form of pastes and solutions have been introduced to counteract this. They humidify dusts causing them to settle. For this application magnesium chloride solution from K+S KALI GmbH is used.

Hippodromes, Park Paths, Tennis Courts etc.

Due to its hygroscopic and water-retaining qualities, magnesium chloride is a popular dust binder that is used successfully on nearly all non-solid surfaces such as paths, sports facilities, exhibition areas, construction sites and parking lots.



Electrolysis

Potassium hydroxide (KOH) is produced by electrolysis, using potassium chloride solution.

In recent years, membrane technology has been used in addition to the classical amalgam-process. For both procedures, the purity of the KCl brine used for electrolysis plays an essential role.

Due to its low contents of secondary substances, potassium chloride produced by the K+S KALI GmbH is perfectly suited for chlor-alkali electrolysis and has been used successfully for many years all over the world.

Electroplating

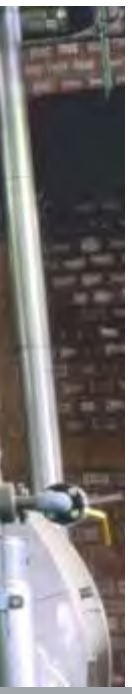
Electroplating is performed by dipping a material into an acid compound. Potassium chloride is used as a conducting salt in this process as it helps achieve a high voltage and therefore reduce the amount of time each individual piece must be submerged in the acid bath.

If potassium chloride is used instead of ammonium chloride, ductility is slightly raised, serving to avoid the appendant waste-water-related problems.

Industrial Applications

Magnesium sulphates and chlorides, as well as potassium chlorides and sulphates produced by K+S KALI GmbH are versatile natural minerals with a wide range of possible applications, such as:

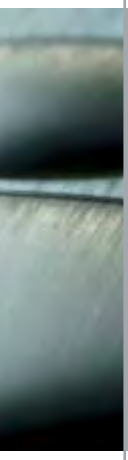
- a source of potassium or magnesium for compound manufacturing
- a binding agent in grinding stones
- for palm oil fractionation
- a processing aid in polystyrene production
- for humidifying rags, sponges, flowers
- a component of cooling brines
- for weighting tractor tires
- a catalyst for resins
- a blasting abrasive



Leather Production

Magnesium sulphate is used as a processing aid in leather production.

The addition of epsom salt results in more supple leather, promotes bonding of the tanning agents with the skin substance and raises the leather's weight. Natural epsom salt from K+S KALI GmbH is therefore an important contributor to high-quality leather.



Metallurgy

Potassium salts play an important role in metallurgical processes. Potassium chlorides produced by K+S KALI GmbH are applied in surface treatment and galvanising, as hardening and brazing salts, as well as in casting chemistry, as smelting and drossing fluxes.

Aluminium scrap is melted down together using a mixture of sodium chloride and potassium chloride as a flux which removes impurities and converts scrap materials into high-grade alloys. Where transport allows, salt slag resulting from this process can be serviced and recovered in our own recycling facility.

Oil Drilling

Potassium chloride is an essential component of most water-based drilling mud's used in oil drilling and exploration. During drilling it has a stabilising effect on shale and clay horizons.

Additionally, potassium chloride is also used in oil production.

Production of ABS/EPS Plastics

ABS plastics are valuable thermoplastics with an ever-increasing range of applications. In their production, by graft copolymerisation in emulsion, the polymer is separated by coagulation of the emulsifier. Salts with multivalent cations are applied as coagulants.

Magnesium sulphate is an inexpensive and easy to use product for this process and is therefore the most commonly used coagulant worldwide. It is also much less corrosive than other salts.

Production of Construction Materials

Potassium Sulphate

Calcium sulphate hemihydrate ($CaSO_4 \cdot 1/2\,H_2O$) and anhydrite ($CaSO_4$) take up water while converting to plaster ($CaSO_4 \cdot 2\,H_2O$). This process forms crystals in the shape of intergrowing and interlocking needles, providing this construction material with the desired stability.

For the workability of the material, the setting and hardening process needs to be adapted to specific requirements by using activators or inhibitors

K+S KALI GmbH potassium sulphate is one of the most effective and commonly used activators for anhydrite based floor plasters, special gypsums and gypsum plasterboards.

Magnesium Salts

Aqueous mixtures of magnesium chloride or magnesium sulphate and magnesium oxide form basic chlorides such as $5\,Mg(OH)_2 \cdot MgCl_2 \cdot 8\,H_2O$ while hardening. This magnesia binder, also called Sorel-cement, is used as a binder for floorings, and in the production of abrasive materials and grindstones. Generally, a weight ratio of $MgO : MgCl_2 = 2{,}5\text{-}3{,}5 : 1$ is chosen. Magnesium chloride is added as a solution ranging from 17 - 30 % $MgCl_2$.

Floorings made with magnesia binders are of exceptional quality, exhibit great resistance to wear and high elasticity and bending tensile strength properties. Therefore they are often used for industrial floorings.

Production of Drying Agents

In organic reactions, residual water in solvents may interfere with the processes and can decompose reactants. Drying agents are used to remove residual water from such solvents.

Due to its hygroscopic qualities, magnesium sulphate anhydrous is used as a mild desiccant for organic solvents in chemical laboratories.

Production of Paints and Pigments

Dyestuffs also require potassium compounds. KCl is used for salting out azo and anthraquinone dyestuffs with a sulphonic acid group from aqueous solutions. Generally, the dyestuffs' potassium salts are less soluble than their sodium compounds.

In pigment production, potassium sulphate is particularly used as the potassium component for blue pigment and adjusting colour depth.

Production of Potassium Peroxodisulphate

Potassium sulphate serves as a raw material for the production of potassium peroxodisulphate via electrolysis.

Potassium peroxodisulphate is a commonly used initiator for polymerisation in emulsions or in solutions, such as in the production of polyacrylates, polyvinyl acetate and polyvinyl chloride, as well as in co-polymerisation in emulsion of acrylonitrile, butadiene, styrene and other monomers.

Production of Refractories

In the production of refractory materials using magnesium oxide, magnesium sulphate helps the stabilisation of the green body during drying and sintering.

The stable Sorel-cement like compound is responsible for this effect which solidifies in the appropriate temperature range, but which disintegrates into magnesium oxide when temperatures rise.

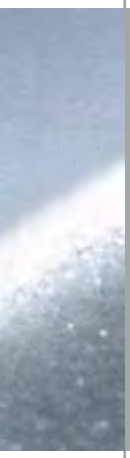
Production of Titanium Dioxide

Depending on the process used, potassium chloride, potassium sulphate or magnesium sulphate can be used as a processing aid for calcination in the production of titanium dioxide.

During calcination the product quality (especially the particle size and degree of whiteness) of titanium dioxide is adjusted. The level of quality (the higher the better) of the processing aids used will also have a positive effect on controlling the production process.

Rayon Production

Rayon production entails the treatment of cellulose with caustic soda and carbon disulphide, transforming it into viscous cellulose xanthate. The resulting viscose is then pressed through the holes of spinnerets into the spinning bath, and spun into filaments. Magnesium sulphate is one ingredient within these spinning baths.



Saltbath Brazing

This technique is particularly suited for the production of construction components with inaccessible solder joints. The manufacturing of heat exchangers, which are composed of alternating corrugated and flat aluminium sheets is a good example for this technique and application.

Potassium chloride is used for salt bath brazing.

Sugar Production

The crystallisation of sucrose from sugar beet syrup is inhibited by potassium and sodium salts. Sucrose solubility is markedly decreased by exchanging the alkali ions with the strongly hydrated magnesium ions.

This process – named Quentin process after its inventor – produces by 0.4 - 0.5 % higher sugar yields. Organic resins are used for the ion exchange; their regeneration is effected by a magnesium chloride solution.

Water Softening

Ion exchangers remove calcium and magnesium ions from hard water. These ions are mainly responsible for increasing wear on dishwashers, washing machines and power station boilers.

In water softening, potassium chloride serves to efficiently regenerate ion exchangers.

Water Treatment

Magnesium sulphate or a solution of magnesium chloride is used for eliminating both ammonium and phosphate ions from waste water. This process yields the almost insoluble mineral struvite.

Winter Road Clearance

Magnesium chloride is strongly hygroscopic, with a lowest freezing point at -33 °C in a 21 % aqueous solution. These qualities make it perfectly suited as a de-icing agent for winter services. Due to the increasing popularity of de-icing with pre-wetted salt, magnesium chloride is now in great demand. For this procedure, NaCl is mixed with a $MgCl_2$-solution (30 %) just before application.

The main advantages include the exceedingly good adhesion to the road, thereby substantially economising the use of salt by reducing wind transport, an immediate melting effect even at very low temperatures combined with a persisting thaw effect.

Zeolite Production

Zeolites are crystalline aluminosilicates. These may be found in a great number of modifications within the natural environment, but may also be produced synthetically. Potassium chloride is used in synthetic zeolite production for adjusting pore size.

These zeolites are generally used as molecular sieves for applications such as natural gas purification.

Product Overview

K+S KALI GmbH offer a range of industrial raw materials which includes potassium sulphates, potassium chlorides as well as magnesium chlorides and magnesium sulphates.

Our product pages contain information on product composition, relevant application areas and certification. Existing certificates and technical bulletins are available for download on our website www.kali-gmbh.com.

Potassium Chloride
approx. 96 % KCl – For Application in Oil Drilling
approx. 97 % KCl – For Application in Metallurgy

Product Features
- high purity
- low content of secondary salts
- almost completely soluble
- no organic additives

Relevant Application Areas
- oildrilling
- metallurgy
- carrageenan

Product Composition
96 % KCl
97 % KCl

Certification
certified according DIN EN ISO 9001:2000

Recommendations for Use
In oil drilling and exploration, KCl 96 % is used as an ingredient in drilling mud's, particularly for stabilising shale and clay horizons, and for oil production.
In metallurgy, KCl 97 % is used as an ingredient in smelting and brazing salts, as well as in salt baths.
In carrageenan production, it is used for precipitating kappa and iota carrageenan after extraction.

Potassium Chloride approx. 99 % KCl
KCl – For Application in Electrolysis

Product Features
- high purity
- low content of secondary salts
- almost completely soluble
- no organic additives
- particularly low heavy metal content

Relevant Application Areas
- electrolyses
- oildrilling
- metallurgy
- production of paints and pigments
- zeolite production
- production of titanium dioxide
- water softening
- electroplating

Product Composition
99 % KCl

Certification
certified according DIN EN ISO 9001:2000

Recommendations for Use
In chlor-alkali electrolysis (amalgam process as well as membrane process), KCl 99 % is used for the production of caustic potash and chlorine. In oil drilling and exploration, our product is used as an ingredient in drilling mud's, particularly for stabilising shale and clay horizons, and for oil production. In metallurgy, it is used as an ingredient in smelting and brazing salts, as well as in salt baths.

In pigment production, KCl 99 % is used for salting out of water-soluble azo- and anthraquinone dyestuffs. In zeolite production, this product is used to modify pore size. In carrageenan production, it is used for precipitating kappa and iota carrageenan after extraction. In weak acidic electroplating it is used as a conducting salt. In titanium dioxide production KCl 99 % is used as a processing aid in calcination for monitoring product quality. In water softening our salt is used as a substitute for sodium chloride, for regenerating ion exchangers.

Potassium Chloride 99.3 % KCl technically pure
KCl – A Versatile Raw Material for Technical Applications

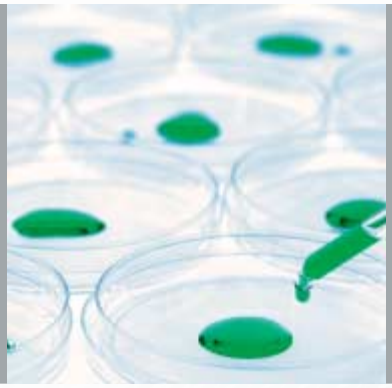
Product Features
- high purity
- particularly low content of secondary salts

Relevant Application Areas
- biotechnology
- water softening
- saltbath brazing
- cosmetics

Product Composition
99.3 % KCl

Certification
certified according DIN EN ISO 9001:2000

Recommendations for Use
In biotechnology, KCl 99.3 % is used as a source of the macro nutrient potassium for micro-organisms. For water softening, the salt serves as a substitute for sodium chloride in the regeneration of ion exchangers. In metallurgy, it is used as an ingredient in brazing baths. The cosmetics industry also uses KCl 99.3 % as a raw material.



Potassium Sulphate approx. 93 % and approx. 95 % K_2SO_4
K_2SO_4 – In the Construction Industry

Product Features
- low content of secondary salts

Relevant Application Areas
- production of construction materials

Product Composition
93 % K_2SO_4
95 % K_2SO_4

Certification
certified according DIN EN ISO 9001:2000

Recommendations for Use
In order to render construction materials based on calcium sulphate more workable, the setting and hardening process needs to be adapted to specific requirements. Potassium sulphate is used as an activator for the setting process.

Potassium Sulphate approx. 97 % K_2SO_4
K_2SO_4 – For Persulphate Production

Product Features
- high purity
- low content of secondary salts
- low chloride content
- low content of insolubles

Relevant Application Areas
- production of potassium peroxodisulphate

Product Composition
97 % K_2SO_4

Certification
certified according DIN EN ISO 9001:2000

Recommendations for Use
K_2SO_4 97 % is used as a raw material for the production of potassium peroxodisulphate via electrolysis.

Potassium Sulphate 99.6 % K_2SO_4 technically pure K_2SO_4 – A Versatile Raw Material for Technical Applications

Product Features

- high purity
- particularly low content of secondary salts

Relevant Application Areas

- biotechnology
- production of potassium peroxodisulphate
- cosmetics

Product Composition

99.6 % K_2SO_4

Certification

certified according DIN EN ISO 9001:2000

Recommendations for Use

In biotechnology, K_2SO_4 99.6 % is used as a source of the macro nutrients potassium and sulphur for micro-organisms. This salt is also used as a raw material for the production of potassium peroxodisulphate via electrolysis. Our product may also be used as a raw material in the production of cosmetics.

Potassium Sulphate `Special fine´ K_2SO_4 – In the Building Materials Industry

Product Features

- low content of objectionable secondary salts
- particularly fine-grained

Relevant Application Areas

- production of construction materials

Product Composition

85 % K_2SO_4

Certification

certified according DIN EN ISO 9001:2000

Recommendations for Use

For the workability of the material, the setting and hardening process of building materials based on calcium sulphate that need to be adapted to specific requirements. Potassium sulphate is used as an activator for the setting process.

Epsom Salt pure, technical and fine crystalline Epsom Salt – A Versatile Raw Material for Technical Applications

Product Features

- exceedingly high purity
- low content of secondary salts
- low content of heavy metals
- dissolves quickly in water practically without any residues and with a slight cooling effect

Relevant Application Areas

- biotechnology
- industrial applications
- production of ABS/EPS plastics
- rayon production
- detergent production
- pulp production
- production of leather
- cosmetics

Product Composition

49 % $MgSO_4$

Certification

certified according DIN EN ISO 9001:2000

Recommendations for Use

Chemical industry uses this salt as a versatile raw material for the production of other magnesium compounds. Epsom salt is used as a coagulant in ABS-/EPS-production via emulsion polymerisation. In rayon production it is used as an ingredient in spinning baths.

Epsom salt is applied as a stabilising agent for bleaching products such as peroxides and perborates, which are commonly used in detergents. In liquid detergents i.e. dishwashing agents, the product is used for adjusting viscosity.
In cellulose production, epsom salt is used to increase selectivity in oxygen delignification, as well as in peroxide and oxygen supported bleaching stages. Magnesium sulphate raises cellulose quality and helps to save process chemicals.
Epsom salt is used as a processing aid in leather production.
The addition of epsom salt results in more supple leather, promotes bonding of the tanning agents with the skin substance and raises the leather's weight.

Magnesium Sulphate Anhydrous $MgSO_4$ – Perfectly Suited for Pulp Industry

Product Features

- high purity
- low content of secondary salts
- Fast dissolution in water, release of heat
- high content of active substance

Relevant Application Areas

- cellulose production
- industrial applications
- production of construction materials
- production of ABS/EPS plastics
- rayon production
- production of refractories
- production of drying agents
- detergent production
- cosmetics

Product Composition

min. 98 % $MgSO_4$ (calculated with reference to the anhydrous substance)

Recommendations for Use

In pulp production, anhydrous $MgSO_4$ is used to increase selectivity in oxygen delignification, as well as in peroxide- and oxygen-supported bleaching stages. Magnesium sulphate raises cellulose quality and helps to save process chemicals.

In the chemical industry $MgSO_4$ anhydrous is used as a very versatile raw material for producing other magnesium compounds. In the construction industry our product is used as a component of Sorel-cement-type mixtures. In the ABS-/EPS-production via emulsion polymerisation the salt is used to coagulate the plastic material. In rayon production, it is used as an ingredient of spinning baths. In the production of magnesium-oxide-based refractories $MgSO_4$ anhydrous is used for stabilising the green body during the drying and sintering process. As a raw material, it is also used in the production of magnesium silicate. $MgSO_4$ anhydrous is also applied as a stabilising agent for bleaching agents such as peroxides and perborates, which are commonly used in detergents. The cosmetics industry also uses this product as a raw material.

Magnesium Chloride Solution, 20 %, 25 %, 30 %, 33 % $MgCl_2$ – A Perfect De-icing Product

Product Features

- excellent road adhesion
- immediate effect even at very low temperatures
- thawing reserve

Relevant Application Areas

- biotechnology
- industrial applications
- production of ABS/EPS plastics
- rayon production
- detergent production
- pulp production
- production of leather
- cosmetics

Product Composition

20 - 33 % $MgCl_2$

Certification

certified according DIN EN ISO 9001:2000

Recommendations for Use

$MgCl_2$ is a strong hygroscopic salt, with a lowest freezing point of -33 °C in a 21 % solution. The available qualities make it perfectly suited for winter service deicing. Due to the increasing popularity of de-icing with a pre-wetted salt, magnesium chloride as a solution is now in great demand.

Already in 1960, Quentin found that ion exchange of the alkali ions against the strongly hydrated magnesium ions markedly lowered sucrose solubility in molasses. Ion exchange is performed by organic resins, the regeneration of which is generally done with $MgCl_2$-solution. This process can raise the sugar yield by 0.4 - 0.5 %.

Product Package Size

	Bag (25 kg)	Bag (50 kg)	Big Bag	Bulk	Tank
Potassium Chloride approx. 96 % KCl technical standard	■	■	■	■	
Potassium Chloride approx. 97 % KCl technical standard				■	
Potassium Chloride 99 % KCl technical industrial	■	■	■	■	
Potassium Chloride 99.3 % KCl technically pure	■		■		
Potassium Sulphate approx. 93 % K_2SO_4 technical standard	■	■	■	■	
Potassium Sulphate approx. 95 % K_2SO_4 technical industrial	■	■	■	■	
Potassium Sulphate approx. 97 % K_2SO_4			■	■	
Potassium Sulphate 99.6 % K_2SO_4 technically pure	■		■		
Potassium Sulphate special fine			■	■	
Epsom Salt pure, technical	■	■	■	■	
Epsom Salt pure, technical, fine crystalline	■	■	■		
Magnesium Sulphate Anhydrous	■	■	■	■	
Magnesium Chloride Solution 20 %, 25 %, 30 %, 33 %					■

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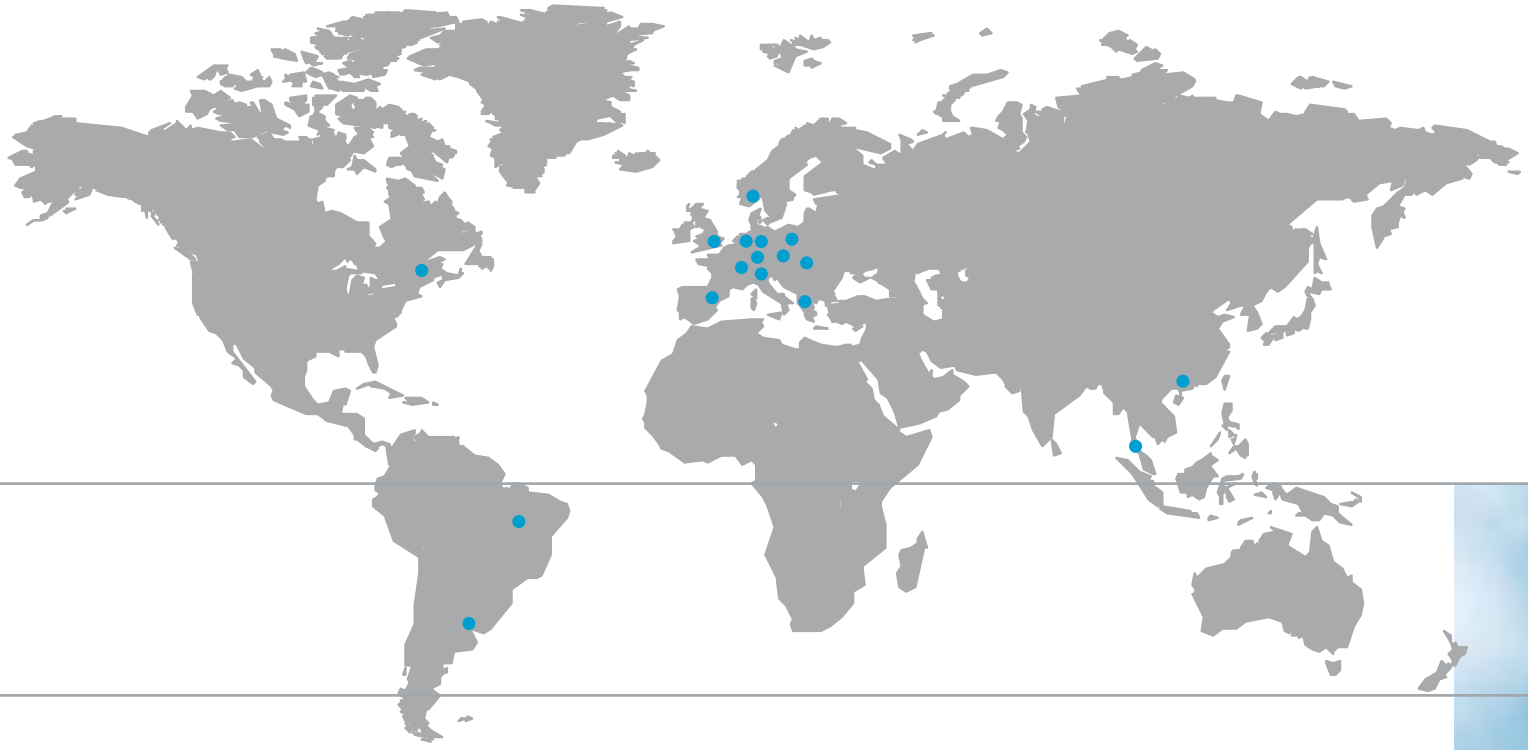

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