



MAGFORUM 2023 
Magnesium Minerals & Markets Conference
30 May-1 June 2023, Grand Hotel Dino,
Baveno, Lake Maggiore (Milan)



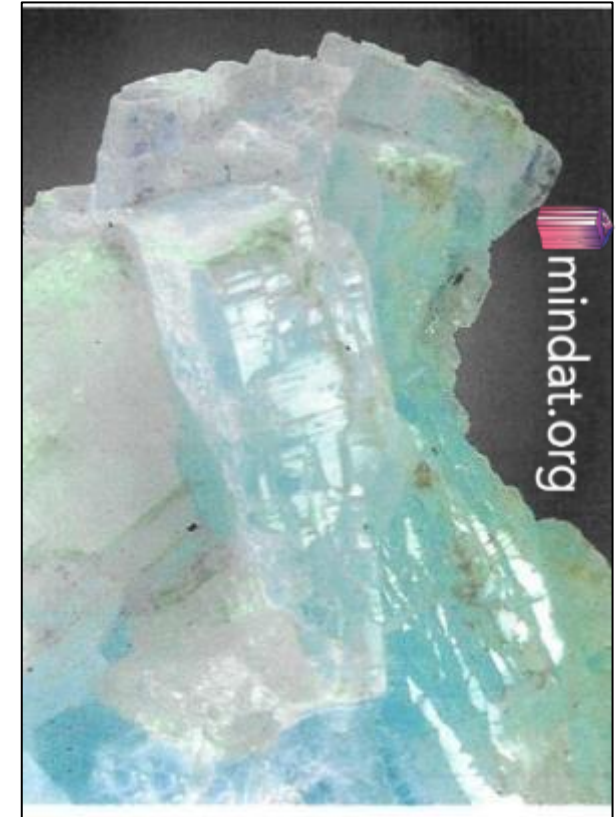
*Brucite, Mengele Marble Quarry,
Cogollo del Cengio, Vincenza
Province, Veneto, Italy*

BRUCITE, HUNTITE AND
HYDROMAGNESITE:
SUPPLY AND MARKETS

Ian Wilson

Consultant, UK

Wednesday 1st June 2023



*Bluish Brucite, Bazhenovsk
Deposit, Asbest, Severdlousk
Oblast, Urals, Russia*

ACKNOWLEDGEMENTS



凤城市华峰水镁矿业有限公司
FENGCHENG HUAFENG BRUCITE MINING CO., LTD

ina Sun, Sales China & Export



Robyn Gul
Sales Engineer



From geology to innovation

Vitaly I'lyn, CEO



Henk Don



Professor Emeritus Stamatakis



Likya Minerals Turkey



GARRISON MINERALS

Mac McCreless



永兴矿业



RHI MAGNESITA



XINYANG MINERALS GROUP

Darren Dong



中国·营口菱镁化工集团有限公司
YINGKOU MAGNESITE CHEMICAL IND GROUP CO.,LTD.CHINA



CREMER ERZKONTOR

Beyond Trading



Ismene Clarke and Mike O'Driscoll



LEHVOSS

Group

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*Blue brucite crystal,
South Africa*

AGENDA

- Brucite,
 - Liaoning Province, China
 - Russian Mining Chemical Company (RMCC)
 - Others - USA
 - Markets
- Hydromagnesite and Huntite
 - Turkey - LKAB, Likya Minerals
 - Greece - Sibelco Hellas S.A. Mining Company
 - Markets

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MAGNESIUM HYDROXIDE

BRUCITE $Mg(OH)_2$

MAGNESIUM CARBONATES

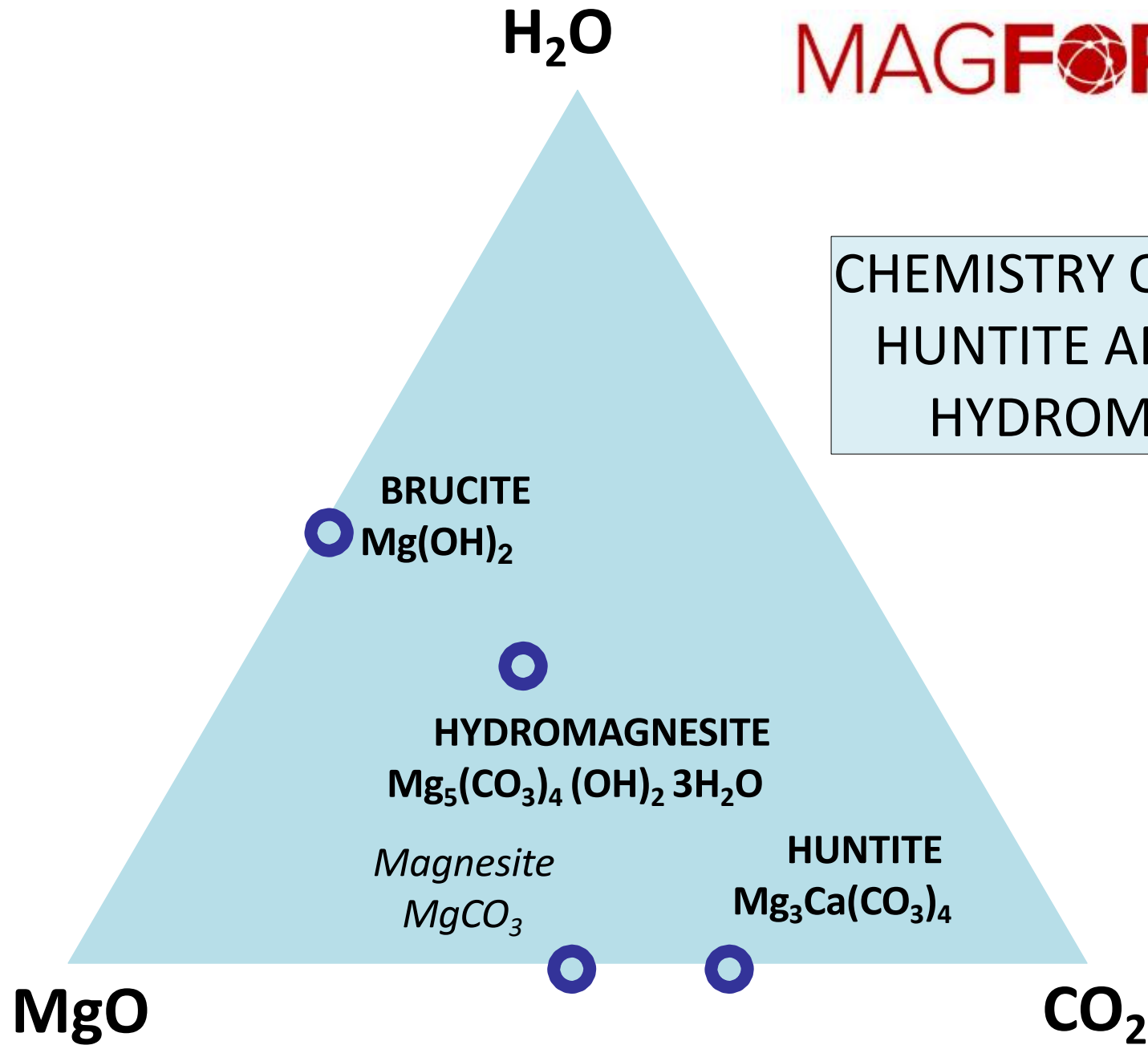
HUNTITE $(Mg_3Ca(CO_3)_4)$

HYDROMAGNESITE $Mg_5(CO_3)_4(OH)_2 \cdot 4H_2O$

MAGNESITE $MgCO_3$

BREUNNERITE $(Mg,Fe)CO_3$

DOLOMITE $CaMg(CO_3)_2$



CHEMISTRY OF BRUCITE,
HUNTITE AND
HYDROMAGNESITE

DETAILS OF BRUCITE

- **Composition:** Hydrous oxide of magnesium
- **Chemical Formula:** $Mg(OH)_2$
- **Pure mineral composition:** MgO - 69.12%; H₂O - 30.88%
- **Crystal System:** Hexagonal, Trigonal
- **Common Form:** Prismatic and broad tabular crystals.
- **Cleavage:** Perfect parallel to the basal pinacoid
- **Hardness:** 2.5
- **Specific Gravity (SG):** 2.39
- **Colour:** White, often bluish, greyish and greenish, red deep brown
- **Lustre:** Vitreous, Waxy, Pearly
- Of industrial magnesium minerals brucite has the highest % Mg content than other raw materials. Low levels of silica, iron and manganese

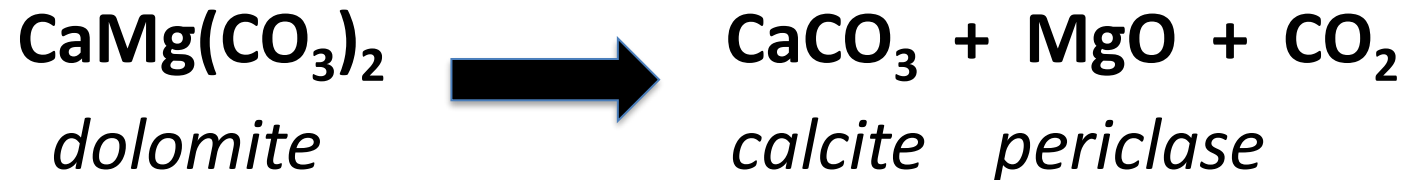
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Name :

*Named in 1824 by Francois Sulpice Beudant in honour of **ARCHIBALD BRUCE** (February 1777-February 1818, New York, USA), physician, early American mineralogist, and editor of the American Mineralogical Journal, who first described the species.*

Mechanism for brucite formation is when dolomitic-marble, or Mg-bearing limestone, is subject to contact metamorphism. Periclase (MgO) is formed and hydrates to brucite in the presence of water







YELLOW BRUCITE

**Well formed yellow Brucite
crystals perched on chromite
matrix from Wadh Mine,
Khizdar District,
Balochistan, Pakistan**

(width of view 12 cms)



Brucite

*Greenish-Bluish Brucite, Bazhenovsk
Deposit, Asbest, Severdlousk
Oblast, Urals, Russia*





BRUCITE

N'Chwaning II Mine,
Kuruman,
Kalahari Manganese Field,
Northern Cape,
South Africa

*BOTRYOIDAL MASS OF CRYSTALS
OF A VIVID COPPER COLOUR*

Courtesy: Joseph Freilich's Photos



Chinese Brucite Companies	Estimated Resources (MT)
LIAONING PROVINCE – FENGCHENG & KUANDIAN	
Liaoning Danding Industry Group Co. Ltd	
Subsidiary Companies	5.0
- Fengcheng Huafeng Mineral Co. Ltd	
- Dandong Riming Mineral Co. Ltd	
- Dandong Hairun Mineral Co. Ltd	
Dandong Yunsing Mining Co. Ltd	3.0
Yinkou Magnesite Chemical Ind Group Co. Ltd (Sinomagchem)	3.0
Fengcheng City Heqi Brucite Mining Co. Ltd	4.0
Star Grace Producer Mining Co. Ltd	-
KMT Industrial (HK) Limited	5.0
Xinyang Minerals Group (subsidiary: Dandong Xinyang Mineral Co. Ltd)	4.0
Dandong Xinda Minerals Co. Ltd	2.0
Dandong Jinyuan Brucite Processing Co. Ltd	26.0
IDENTIFIED RESOURCES IN FENCHENG & KUANDIAN	
OTHER DEPOSITS IN CHINA	
Shaanxi Province, Ningjian Region (fibrous brucite)	7.8
Shimian Asbestos Mine, Ya'an, Sichuan – brucite	-
Ji'an, Jilin Province – brucite	2.0





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LIAONING DANDING INDUSTRY GROUP CO. LTD,
DANDONG, LIAONING PROVINCE, CHINA



- Liaoning Danding Industry Group Co.,Ltd is specialized in brucite, magnesium oxide(MgO), DBM (Dead Burned Magnesite), caustic calcined magnesite (MgO), dolomite, magnesium sulfate ($MgSO_4$, $MgSO_4 \cdot H_2O$, $MgSO_4 \cdot 7H_2O$), and white pebble stone/cobble stone. This section will just deal with the Brucite.
- The company was established in 1989 and owns 7 mines, located in Dandong, Liaoning province, which possesses about two-fifths of the total reserves of brucite in China; 30 years professional manufacturing, more than 20 years export experience, more than 70 million tonnes annual output per year, weekly export to Europe, America, Korea & Japan and other countries. Annual sales exceed 200 million RMB.

Liaoning Dan Ding Industrial Group Co., Ltd.

- ✓ 1000+ Employees
- ✓ 8 Raymond Mill Machines
- ✓ Many advanced calcining furnaces and 2 rotary kilns
- ✓ Passed the ISO9001 in 2008

Magnesium Hydroxide
 $Mg(OH)_2$

Product name: Brucite
Natural magnesium hydroxide



**LIAONING DANDING INDUSTRY GROUP CO. LTD,
LIAONING PROVINCE, CHINA**



Fengcheng Huafeng Brucite Mining Co. Ltd

BRUCITE MINES

Liaoning Danding Industry Group has three brucite mines in Fengcheng area, Liaoning, which are subsidiary companies:

- Fengcheng Huafeng Brucite Mining Co., Ltd - underground mine - for domestic and export markets
- Dandong Riming Material Co. Ltd - underground mine - for domestic and export markets
- Dandong Hairun Mineral Co. Ltd - just for domestic markets



Fengcheng Huafeng Brucite



Dandong Riming Mineral Co Ltd



Dandong Hairun Mineral Co Ltd

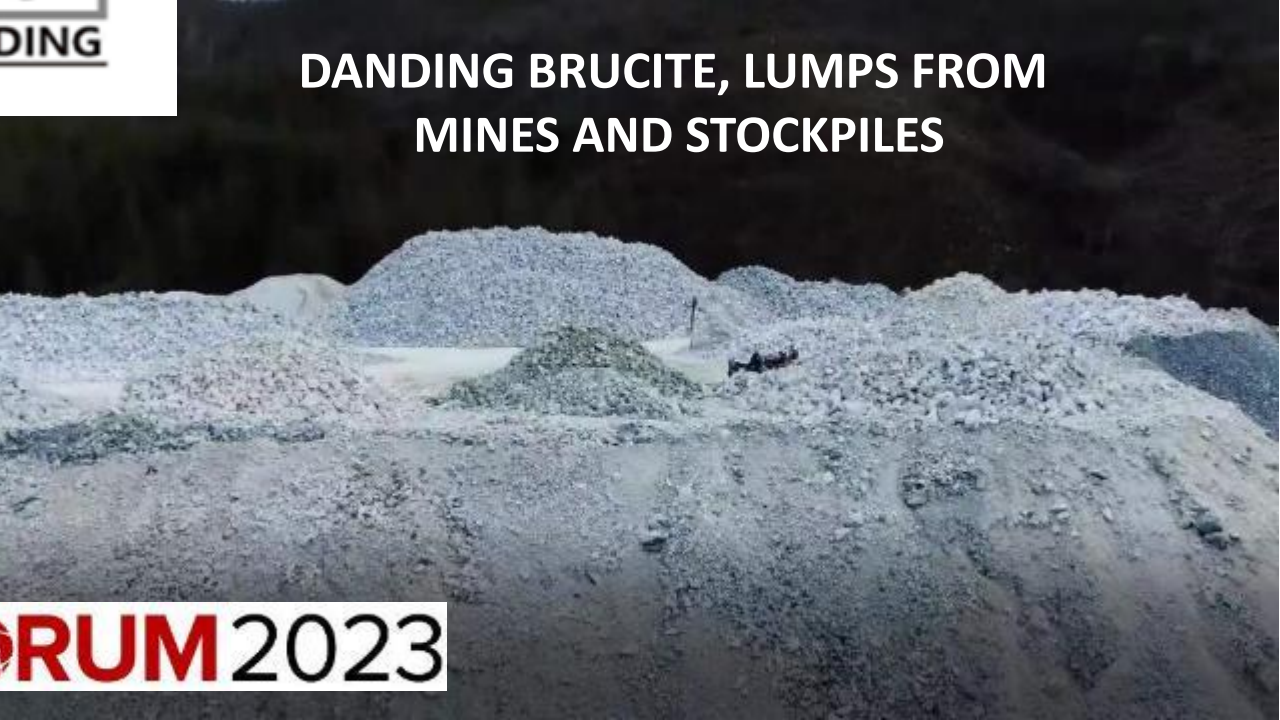
RESERVES OF BRUCITE

- The Brucite mine resources
- are 5.0 MT (5,000,000 tonnes)

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**DANDING BRUCITE, LUMPS FROM
MINES AND STOCKPILES**



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Liaoning Dan Ding Industrial Group Co., Ltd. was established in 2008.



Fengcheng Huafeng Brucite Mining Co. Ltd



Light Magnesium Oxide, Active Magnesium Oxide, Magnesium Oxide, Brucite with high annual output.

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凤城市华峰水镁矿业有限公司
FENGCHENG HUAFENG BRUCITE MINING CO., LTD



Headquarters, Danding, Fencheng City



Factory 1

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Factory 2



Factory 2



Warehouse



Stockpile



凤城市华峰水镁矿业有限公司
FENGCHENG HUAFENG BRUCITE MINING CO., LTD



- Fengcheng Huafeng Brucite_Mining Co. Ltd. is a subsidiary of Liaoning Danding Industrial Group Co. Ltd. The mine was established in 1989. It is Asia's first discovered brucite mine, and its main mineral is brucite.
- They are mainly used in flame retardant, metallurgy, power plant desulfurization agent.
- The mine's brucites resources is 5,000,000 tonnes (5.0 MT).
- The company has now integrated mining, processing, scientific research, trade, and has become an important private enterprise.



Entrance to factory II



Entrance to Mine



Stockpile



PROCESSING



凤城市华峰水镁矿业有限公司
FENGCHENG HUAFENG BRUCITE MINING CO., LTD

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NINA SUN



DANDONG INDUSTRIAL GROUP CO., LTD



凤城市华峰水镁矿业有限公司
FENGCHENG HUAFENG BRUCITE MINING CO., LTD

Nina Sun is in charge of Group sales and responsible for products sales for Dandong Industrial Group and Fengcheng Huafeng Brucite Mining Company:

- Brucite, caustic calcined magnesite, fused magnesia large crystals, and
- Other products related with magnesium for foreign and domestic customers.
- Contact details:
Email: nina@Indanding.com
Mobile: +86 158 0404 3562
On WhatsApp



DANDONG YUNGSING MINING CO., LTD

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- Dandong Yungsing Mining Co., Ltd. is a multi-functional enterprise integrating mining, processing and trade.
- It has the mining rights of two brucite mines. Resources brucite are estimated at 3.0 MT.
- Mining of Brucite is carried out by YUNGSING MINING.
- The factory is 100 km away from Dandong Port and 350 km away from Liaoning's largest seaport in Dalian.
- Advanced equipment, excellent team and unique geographical location make the company one of the main suppliers of magnesium oxide and magnesium hydroxide products in domestic and overseas markets.
- The major products consist of Magnesium Hydroxide flame retardant which is made of high quality Brucite using such technical processes as domestic and overseas professional grind, classification and surface treatment methods. Therefore creating ideal low-smoke, halogen-free, environment friendly flame retardant material. The product is widely applied in domestic and overseas rubber, cable, plastic and various flame resistant materials.
- The products are exported to Japan, Korea, and many countries in Southeast Asia, Europe, and Oceania.

Mine Resources

- Dandong Yungsing Mining Co., Ltd is a multi-functional enterprise integrating mining, processing and trade.
- It has the mining rights of two mines and ensures the stable supply of raw materials.



DRILLING UNDERGROUND



YUNGSING MINING

永兴矿业

UNDERGROUND
MINING



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Global Brand

Many years' presence in global magnesium industry. Well known as the famous trademark in the world. Products exported to more than 60 countries and regions.



- Sinomagchem is a private shareholding company based in Dashiqiao, known as the Magnesite Metropolis in Liaoning Province of China.
- As the important magnesite chemical manufacturing company in China, the company has a rich reserve of magnesite resources with strong productivity and research capability. All these capabilities and our comprehensive strength empower us to become one of the global specialized leaders in the world magnesium industry.
- At present, we have 3 series of products with more than 100 varieties of specifications that contribute to a total production capacity 700,000 tonnes annually. The products are applicable for use in fertilizer, feed stock, chemical industry, environmental protection, textile and leather, medicine, food. and have been exported to more than 60 countries and regions worldwide.
- Associated with Yingkou Magnesite Chemical Ind Group Co Ltd for sales of Brucite produced in Liaoning. Estimated Resources of Brucite 3.0 MT.



中国·营口菱镁化工集团有限公司

YINGKOU MAGNESITE CHEMICAL IND GROUP CO.,LTD.CHINA

Fertilizer Grade Products

Magnesium oxide plays an important role in promoting the synthesis of chlorophyll and improving the quality of the plants. It can influence the growth of the plants and is especially applicable to acidified soil

★ Magnesium Oxide or Calcined Brucite Magnesium Oxide

MgO(%min)	SiO ₂ (%max)	CaO(%max)	Fe ₂ O ₃ (%max)	Al ₂ O ₃ (%max)	L.O.I.(%max)	PH	Size(≥90%)
90	4.5	3.5	1.0	0.5	5.0	8-11	80/100/ 200/ 325mesh
85	8.0	4.0	1.5	1.0	9.0	8-11	80/100/ 200/ 325mesh 2-4mm/2- 5mm/2-6mm



中国·营口菱镁化工集团有限公司
YINGKOU MAGNESITE CHEMICAL IND GROUP CO.,LTD.CHINA

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Magnesium Oxide

Magnesium Oxide Products

Feed grade MgO can make animals healthy and it is a good feed additive.

Grade	MgO(%min)	Mg(%min)	Pb (ppm max)	As (ppm max)	Hg (ppm max)	Cd (ppm max)	size
A	90	54	10	10	1	10	Mesh Powder 0.1-1/0.1-2mm 90%min passing through
B	87	52	10	10	1	10	
C	85	51	10	10	1	10	

Magnesium Oxide Products

Magnesium Oxide is broadly used in chemical industry, paper making, metallurgy and environmental protection etc. It is with the advantages of stable quality, good activity, high purity and complete in variety.

MgO(%min)	SiO ₂ (%max)	CaO(%max)	Fe ₂ O ₃ (%max)	Al ₂ O ₃ (%max)	L.O.I.(%max)	Size(≥90%)
92	4.0	3.0	1.0	1.0	4.0	80/100/ 200/325mesh
90	4.5	3.5	1.0	0.5	5.0	
85	8.0	4.0	1.5	1.0	9.0	



FENGCHENG CITY HEQI BRUCITE MINING CO, LTD

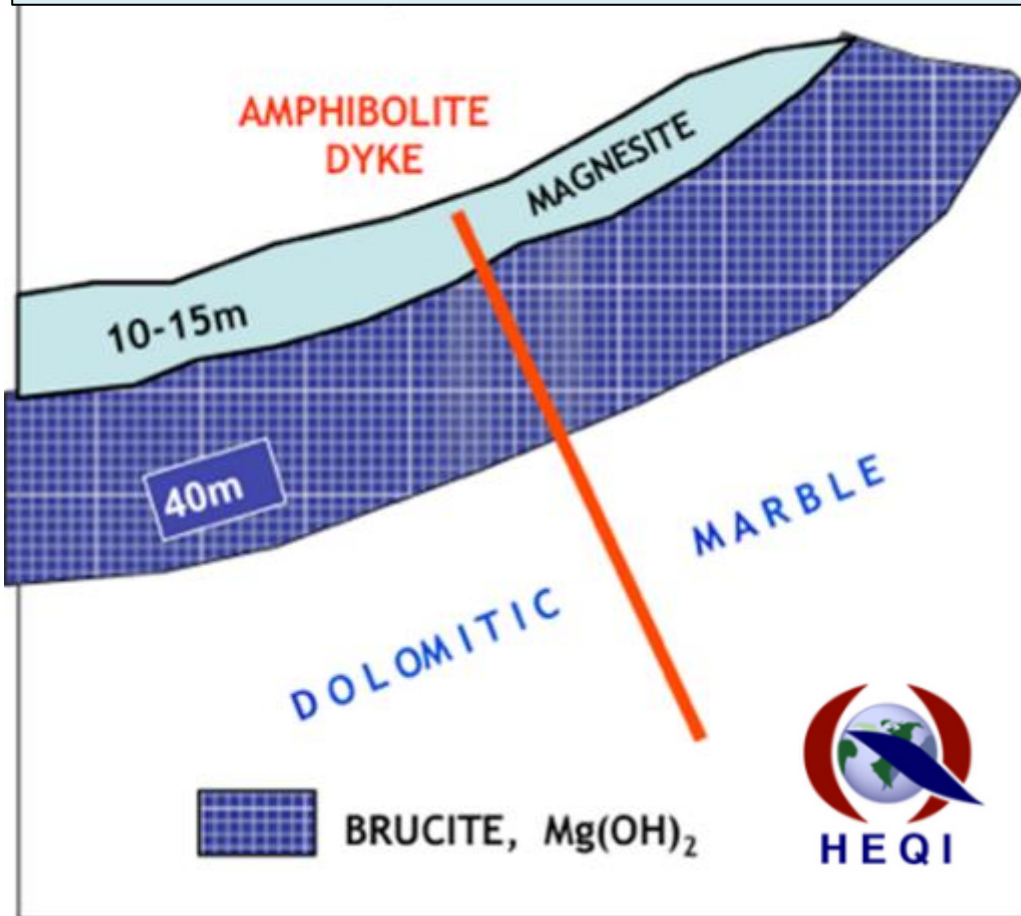


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FENGCHENG CITY HEQI BRUCITE MINING CO.,LTD PROCESSING

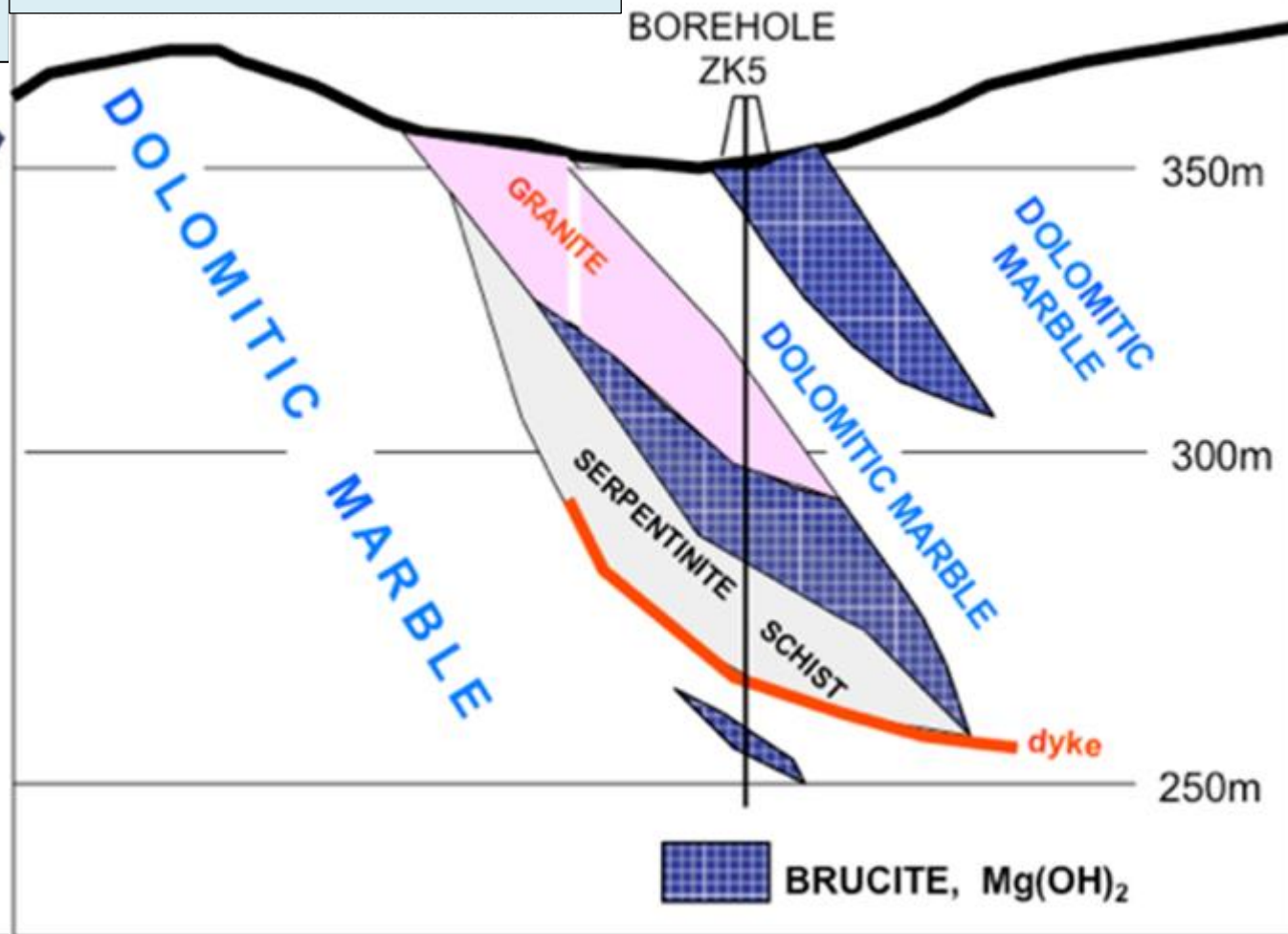


FENGCHENG CITY HEQI BRUCITE MINING CO. LTD
DAYANGGOU VILLAGE, JIGUANSHAN TOWN



Magnesite overlying brucite
within dolomitic marble

CROSS SECTION OF BRUCITE MINE



Brucite within dolomitic marble and associated with granitic intrusion. Crystal size increased by intrusion of amphibolite dyke



FENGCHENG CITY HEQI BRUCITE MINING CO, LTD

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- Fengcheng City Heqi Brucite Mining Co., Ltd., is an imports and exports mining company registered in 1998 in Fengcheng City of Liaoning Province. The company is located in Fengcheng City.
- Primarily engaged in processing minerals. The company property mainly manufactures magnesium hydroxide flame retardant and brucite powder. Also produces some Hydromagnesite.
- The export work is handled by Dalian Hexin New Material Technology Co., Ltd. Our annual output amount is up to 100,000 tonnes.
- During several years developing, the company possesses own mines and processing plants, It consists of the Heqi brucite mine in Fengcheng city. The mesh of goods are 325 mesh-6000 mesh
- Resources of brucite 4,000,000 tones, annual output is 100,000 tonnes.
- Products have been sold in Europe, America, Asia and other countries.



FENGCHENG CITY HEQI BRUCITE MINING CO, LTD

BRUCITE SPECIFICATIONS

MgO %	SiO ₂ %	CaO %	Fe ₂ O ₃ %	Al ₂ O ₃ %	LOI %
53.54	11.26	5.69	0.58	0.15	28.78
55.25	9.56	3.18	0.36	0.13	31.52
58.51	6.63	2.56	0.36	0.12	31.82
60.62	4.84	2.42	0.34	0.12	31.66
62.59	3.68	2.12	0.34	0.11	31.16
63.39	3.39	1.56	0.32	0.11	31.23
64.36	2.49	1.17	0.32	0.11	31.55
65.13	1.8	1.07	0.32	0.09	31.59

MAJOR MARKETS

- Agriculture Grade Magnesium Hydroxide
- Magnesium Hydroxide for Aluminum Composite Panel
- Magnesium hydroxide for flue gas desulfurization
- Fertilizer Grade Magnesium Hydroxide
- Flame Retardant Magnesium Hydroxide

PROCESSING AT HEQI BRUCITE MINING CO. LTD





Star Grace Mining Co., Ltd

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- Star Grace Mining Co., Ltd. is a privately owned company established in 1990 as a mining and factory of Magnesium oxide, DBM and Magnesium sulphate Heptahydrate and Kieserite.
- Star Grace's Magnesite Mine could continuously exploit for a hundred years. Finished the equipment reform in 2018, and make sure the pollution is controlled and complies with environment-friendly requirements of the Ministry of Environmental Protection. Professional Team.
- Load over 250 containers from Dalian port per week and 6000MT cargo in Breakbulk vessel to South America per month. Export volume export capacity is 188,000MT per year and Star Grace strive to be the Number one Magnesium Sulphate exporter in China. The main market, Latin America, South East Asia and Europe.
- Star Grace have a brucite factory in Liaoning which is supplied with 100,000 tpa of brucite. This report will cover the markets for brucite.
- Main market is Europe, South East Asia, South America and Africa



Fertilizers	<p>Spicification : MgO Powder Purity ---60% , 65% , 80% , 85% , 90%</p> <p>Application: NPK Blending factory or plantations</p>
Feeds	<p>Spicification : MgO Powder or Granular ---85% , 90% , 92%</p> <p>Application: Feed premix , aquafeed</p>
Industry	<p>Specification: MgO Powder 85% , 90% , 92% , 94%</p> <p>Application: Desulfurization, Waste Water treatment, Paper-making, Abrasive, Chemicals, Construction, Rubber and plastics, oil drilling</p>



Star Grace Mining Co.,LTD



Feed additives

Product: MgO 65%, MgO 85%, MgO 90%

Appearance: Powder, Sand, Granular

Main Market: Chile, Peru ,Colombia ,Ecuador, Mexico, Australia ,New Zealand, Vietnam, Indonesia



Fertilizer

Product: MgO 65%, MgO 85%, MgO 90%, MgO 92%

Appearance: Powder, Granular

Main Market: Peru ,Colombia, Ecuador, Mexico, Costa Rica, Dominican Republic



Flue gas desulphurization

Product: MgO 65%,MgO 85% ,MgO 90%

Appearance: Powder, Sand ,Granular

Main Market: Vietnam



Water Treatment

Product: MgO 85%, MgO 90%, MgO 92%

Appearance: Powder

Main Market: United Arab Emirates, South Africa



Paper Industry

Product: MgO 85%, MgO 90%, MgO 92%

Appearance: Powder ,Granular

Main Market: Germany, United Arab Emirates



MARKETS
FOR
BRUCITE



BRUCITE 60%-65%

Main Market: Europe, Asia, Middle East

Available Shipping to:

Poland: Gdańsk, Gdynia

Netherland: Rotterdam

Spain: Algeciras, Valencia, Barcelona, Castellon

Italy: Genoa, Livorno, Cagliari, Ravenna

#Contact us with brucite usage and destination port
for more information.

STAR GRACE MINING CO.,LTD



**Brucite 60%-65% and main
markets and shipping**





PROCESSING AND BAGGING

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SPECIFICATIONS - STAR GRACE MINING CO., LTD

Items	Brucite-60%	Brucite-63%	Brucite-64%	Brucite-65%
MgO	60.0%Min	63.0%Min	64.0%Min	65.0%Min
SiO ₂	5.0%Max	5.0%Max	4.5%Max	4.0%Max
CaO	3.0%Max	3.0%Max	2.5%Max	2.0%Max
Fe ₂ O ₃	1.0%Max	1.0%Max	0.5%Max	0.5%Max
Al ₂ O ₃	0.5%Max	0.5%Max	0.3%Max	0.3%Max
LOI	40% Max	40% Max	40% Max	40% Max

Size:60mesh,100mesh,325mesh,10-60mm, 0-0.3mm, granular



BRUCITE 60%-65%

WHY CHOOSE STAR GRACE?

- One of the world's top Brucite mine area
- Rich reserves
- High production capacity, ensure long-term supply
- Excellent quality, nice final product performance
- Consistent quality as always
- Customizable packaging options



Brucite



Delivery in Break Bulk Vessel





Maggie Wang

Contact details for Maggie Wang

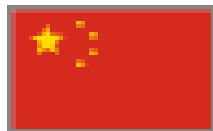
- Tel: +86 186 9860 2699
- Fax: +86-411-84721630
- Email: maggiewang@stargrace-chemical.com
- Address: 1A-4-506 Ruanjing Center, Ruanjianyuan Road, Shahekou District, Dalian, Liaoning, China
- Maggie Wang is the Sales person for all magnesium products including Brucite.

COUNTRY	COMPANY	DEPOSITS	RESOURCES (MT)
CHINA	16 COMPANIES	MAINLY FENCHENG, AND KUANDIAN, LIAONING	26
N. KOREA	NORTH KOREAN	GIL ZU, YANGGANG	2
RUSSIA	RUSSIAN MINING CHEMICAL COMPANY (RMCC)	KULDUR SAVINSKY	10 22
USA	BRUCITE INTERNATIONAL CORP (BRUCITIC MARBLE)	VAN HORN, TEXAS	7
	PREMIER MAGNESIA LLC	GABBS, NYE COUNTY, NEVADA	3
			70



Some brucite deposits and resources (MT)

COUNTRY	COMPANY	DEPOSITS	RESOURCES (MT)
CHINA	16 COMPANIES	MAINLY FENCHENG, AND KUANDIAN, LIAONING	26
N. KOREA	NORTH KOREAN	GIL ZU, YANGGANG	2
RUSSIA	RUSSIAN MINING CHEMICAL COMPANY (RMCC)	KULDUR SAVINSKY	10 22
USA	BRUCITE INTERNATIONAL CORP (BRUCITIC MARBLE)	VAN HORN, TEXAS	7
	PREMIER MAGNESIA LLC	GABBS, NYE COUNTY, NEVADA	3
			70



KMT INDUSTRIAL (HK) LIMITED



Natural Brucite



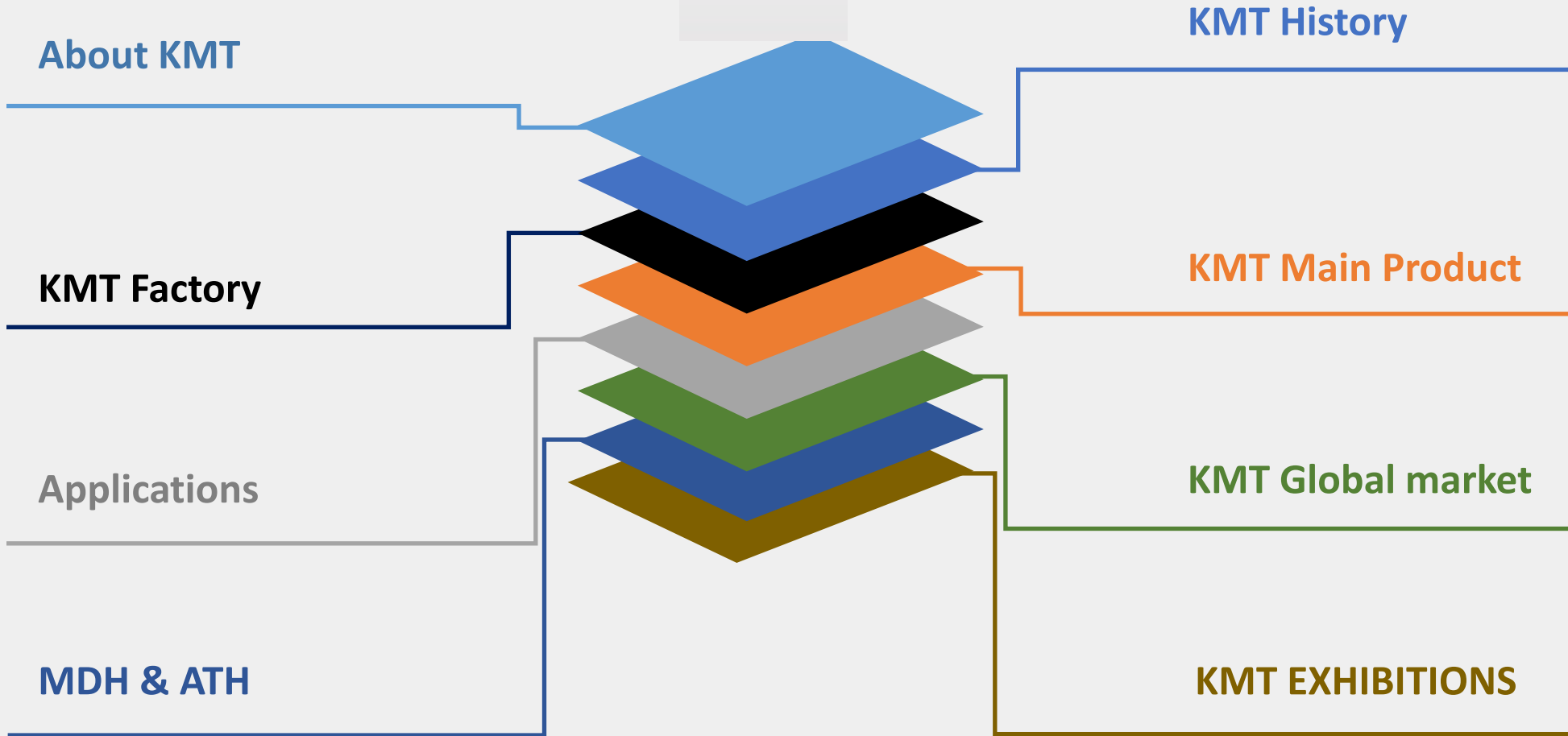
$Mg(OH)_2$

Precipitated Magnesium Hydroxide



Natural Brucite & Magnesium hydroxide

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KMT Industrial (HK) Co., Ltd

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KMT Industrial (HK) Co., Ltd, was founded in 2008, specializes in researching, producing and selling brucite powder, precipitated magnesium hydroxide, magnesium oxide and other flame retardant products.

We have been working with famous professor from Tongji University, Xian Jiaotong University and Lanzhou University, and compounding machine manufacturers like Tianhua, Xinda, Lina and lingood to improve our powder, making it easy dispersing in polymer, and giving better mechanical property to the FR compounds.

We can provide additional technical support for our customer: Compounds mechanical property test, physical property test, thermal performance test, electrical performance test and combustion performance test. We also provide B1/A2 ACP, XLPE, PVC cable compound, LSZH/LSOH/LSFH/OHLS compound turnkey project.

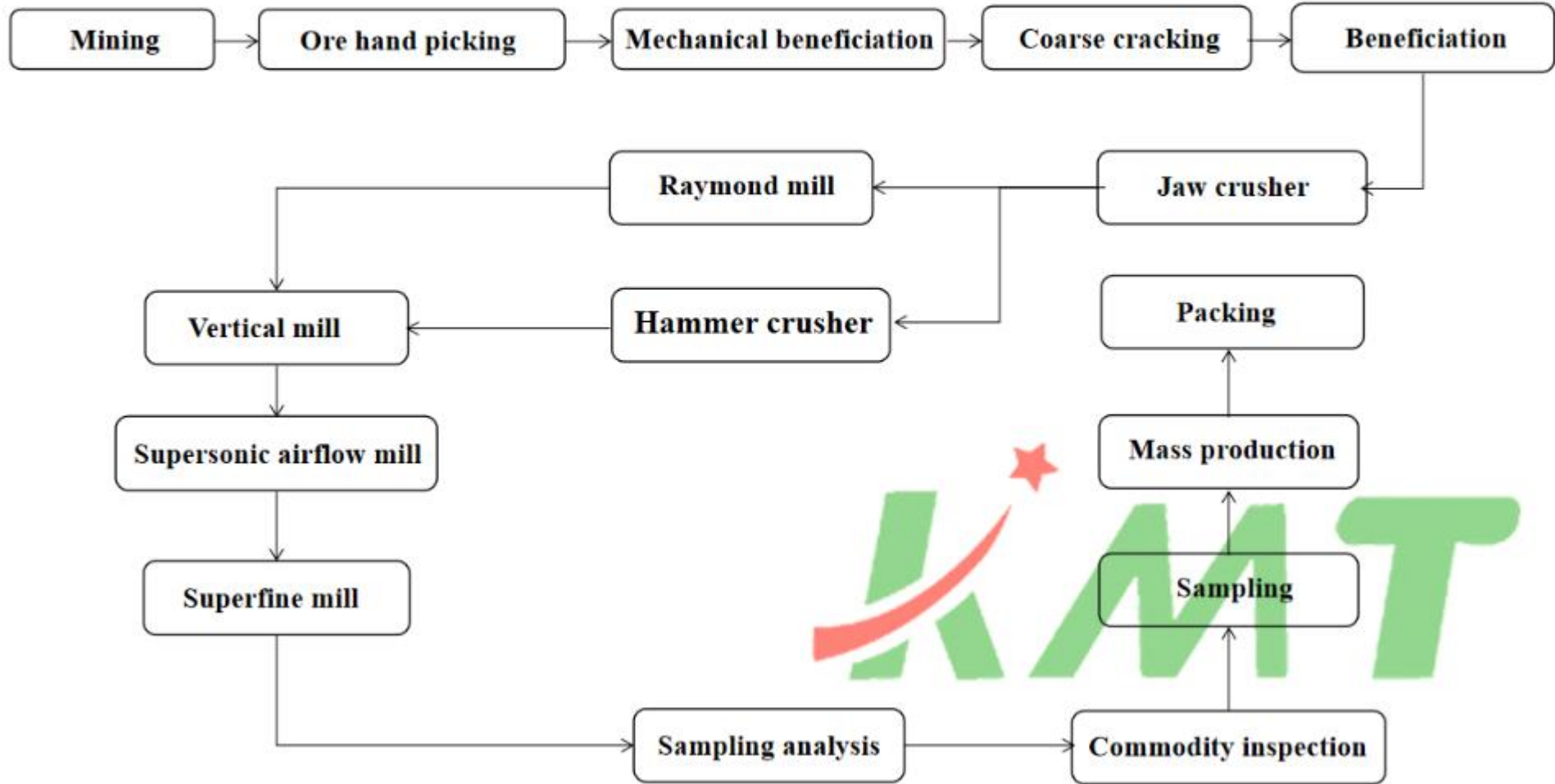
Over the years, we provide the best pre-sales, sales, and after-sales service, to help find the most suitable technical solutions for our customers, so that they can enjoy the best quality customized services, and achieve a win-win situation.





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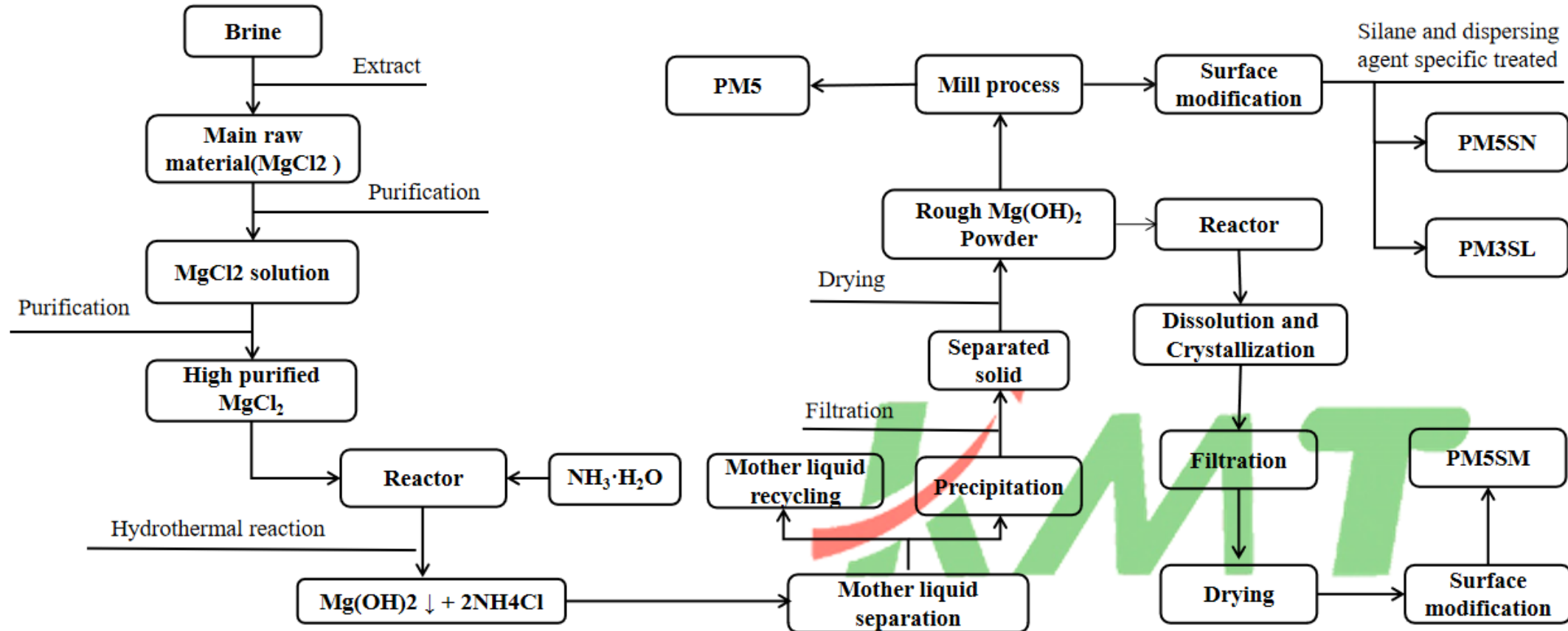
Process Flow Chart of Brucite Powder





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Process Flow Chart of Precipitated Magnesium Hydroxide





KMT History

2008

Mainly focuses on plastic machinery and chemical raw materials trade.

2010

KMT Industrial "chemical raw materials department" was established (2010). Focuses on the technical development and research of flame retardant.

2012

In 2012, KMT Industry expand to develop the global market by selling natural brucite powder

2014

In 2014, Dandong KMT established. We have our own mines. Dandong KMT produces all kinds of coated, non-coated brucite powders.

2016

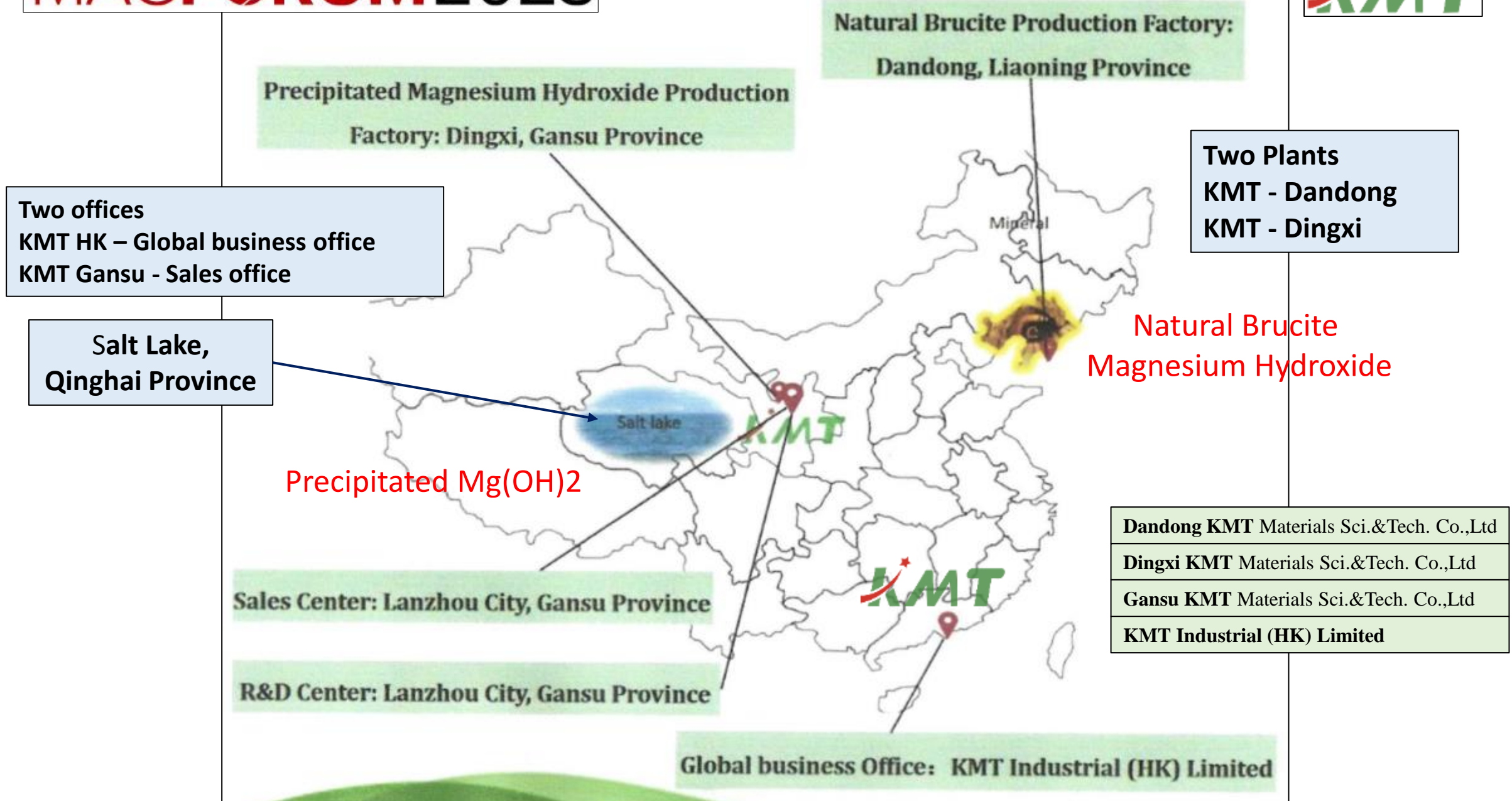
In 2016, Gansu KMT Materials Sci &Tech Co., Ltd. was established, which mainly produces precipitated magnesium hydroxide.

2018~Now

KMT participates in various cable, rubber and plastic exhibitions. KMT can cooperate with more and more companies.



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Two offices
KMT HK – Global business office
KMT Gansu - Sales office

Salt Lake,
Qinghai Province

Two Plants
KMT - Dandong
KMT - Dingxi

- Dandong KMT Materials Sci.&Tech. Co.,Ltd
- Dingxi KMT Materials Sci.&Tech. Co.,Ltd
- Gansu KMT Materials Sci.&Tech. Co.,Ltd
- KMT Industrial (HK) Limited

TWO KMT FACTORIES IN CHINA - BRUCITE AND MAGNESIUM HYDROXIDE



DANDONG BRUCITE FACTORY, LIAONING PROVINCE



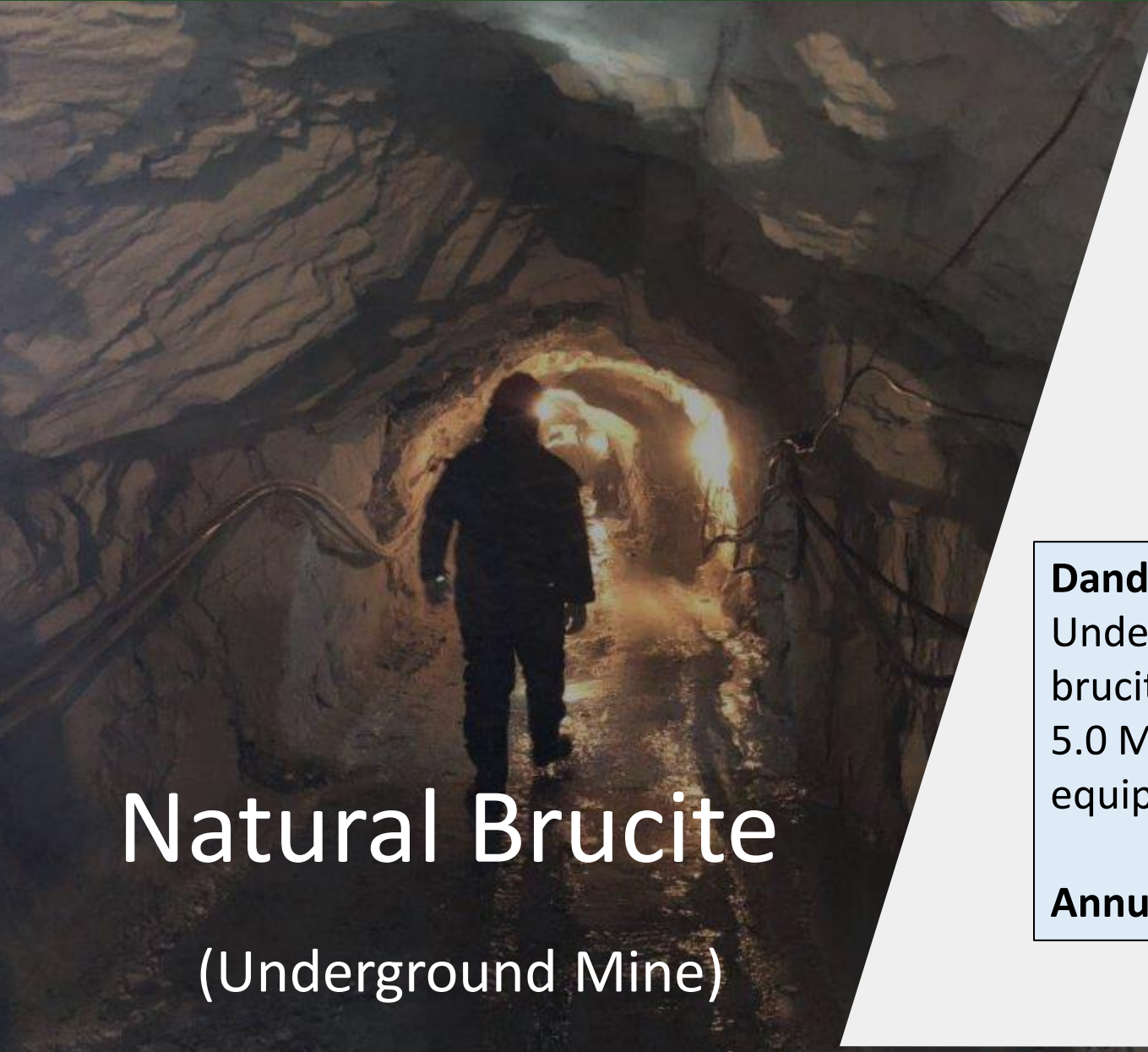
Committed to the production and sales of brucite powder, we have high reserves, high - quality brucite mines and advanced processing equipment, coating equipment.
The annual capacity is 100,000 tonnes.

DINGXI MAGNESIUM HYDROXIDE FACTORY, GANSU PROVINCE



Focuses on the research and development of precipitated magnesium hydroxide. Through magnesium chloride and ammonia water, every year we produce **30,000 tons of high-purity ultra-fine magnesium hydroxide and 10,000 tons of high-purity magnesium oxide**





Natural Brucite

(Underground Mine)

Dandong KMT

Underground mines and the production and sales of brucite powder. Resources of brucite are estimated at 5.0 MT. There are two factories with modern processing equipment including treated coating grades

Annual capacity is 100,000 tonnes.

Factory I - Dandong KMT – Mining, Beneficiation, Milling, Production



**Mining - Ore Hand Picking - Mechanical Beneficiation - Coarse Cracking - Beneficiation - Jaw Crusher -
Milling - Sampling analysis - Mass production - Sampling - Commodity inspection – Packing - Shipping**

KMT Main Products - Brucite powder

Characteristics		Brucite Powder			
		B-1 (Uncoated) B1S (Silane coated) B1SA (Stearic acid coated)	B-2 (Uncoated) B2S (Silane coated) B2SA (Stearic acid coated)	B-3.5 (Uncoated) B3.5S (Silane coated) B3.5SA (Stearic acid coated)	B-10 (Uncoated)
Granulometry (µm)	D50	1-2	2-3	3.5-4.5	8-10
Chemical Composition (%)	Mg(OH) ₂	≥90.0%	≥90.0%	≥90.0%	≥90.0%
	CaO	≤1.5%	≤1.5%	≤1.5%	≤1.5%
	Fe ₂ O ₃	≤1.5%	≤1.5%	≤1.5%	≤1.5%
	Al ₂ O ₃	≤0.5%	≤0.5%	≤0.5%	≤0.5%
	Cl-	-	-	-	-
Properties	L.O.I	≥29%	≥29%	≥29%	≥29%
	Whiteness	≥90%	≥90%	≥90%	≥90%
	Moisture	≤0.5%	≤0.5%	≤0.5%	≤0.5%

KMT Main Product - Magnesium Oxide (high purity)

Characteristics		Magnesium Oxide	
		O-96 (Uncoated)	O-99 (Uncoated)
Granulometry (µm)	D50	63.03 µm	63.03 µm
Chemical Composition (%)	MgO	≥96%	≥99%
	CaO	≤0.01%	≤0.01%
Properties	Iron as Fe ₂ O ₃	≤0.0013%	≤0.0013%
	Loss on ignition	≤3.23%	≤3.23%
	Insoluble in HCl	≤0.04%	≤0.04%
	Whiteness	≥95.9	≥95.9
	Loose appearing density (g/cm ³)	0.5917	0.5917
	Compacted appearing density (g/cm ³)	1.0546	1.0546

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Application

**B-10, B-3.5 Used For
Aluminum Composite Panel**

Brucite powder is currently the most widely used material for the flame retardant core layer of aluminum composite panels.



KMT INDUSTRIAL (HK) LIMITED
Natural Brucite & Magnesium hydroxide

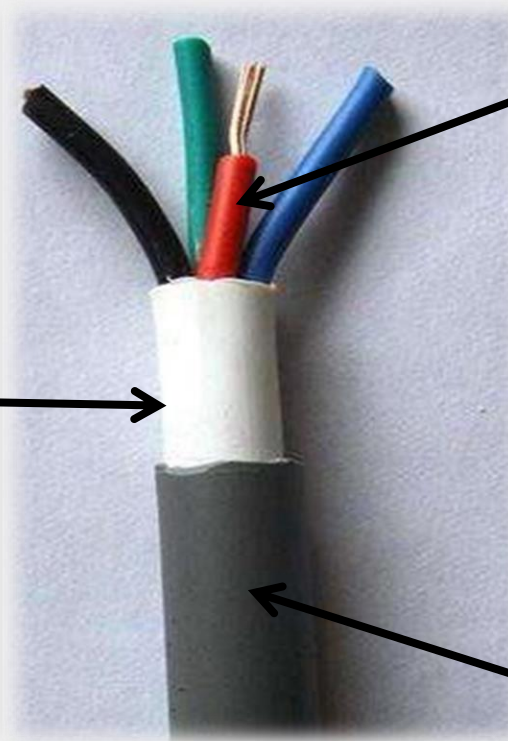


➤ **Brucite- Magnesium Hydroxide for Aluminum Composite Panel**

- ❑ Magnesium hydroxide environmental protection halogen-free flame retardant is a common flame retardant, in addition to flame retardant and smoke elimination performance, and high dehydration temperature, suitable for processing high temperature PP and other polymer flame retardant modification, but also make flame retardant plastic easy to reuse.
- ❑ Representatives of the application of inorganic flame retardant type magnesium hydroxide by chemical decomposition heat absorption and put hot water dilution mass fraction of oxygen in the air, forming insulating layer on the surface of a polymer flame retardant effect of magnesium oxide play are formed by decomposition with non-toxic, smoke, and decomposition product inhibition (aluminum oxide, magnesium oxide) series of chemical stability, so do not produce secondary damage.
- ❑ Aluminum-plastic composite board, referred to as aluminum-plastic board, refers to a 3-layer composite board with plastic as the core layer and aluminum on both sides, and the surface of the product is covered with decorative and protective coating or film (otherwise known as coating) as the decorative surface of the product.

Application

Bedding compound
ca.20% polymer:
EPDM
EVA (high VA content)
mPE (PE-co-octen)
ca.80% filler:
Chalk
MDH (brucite)



Insulation compound

ca.40%polymer:
XLPE
LDPE/MDPE/EVA/mPE
ca.60% mineral flame retardant:
MDH (fine precipitated)
important:low-Electrolyten content

Jacketing compound

35%-40% polymer:
LDPE/MDPE/EVA/mPE
EPDM/EVA
60%-65% mineral flame retardant:
MDH (fine precipitated)

Application



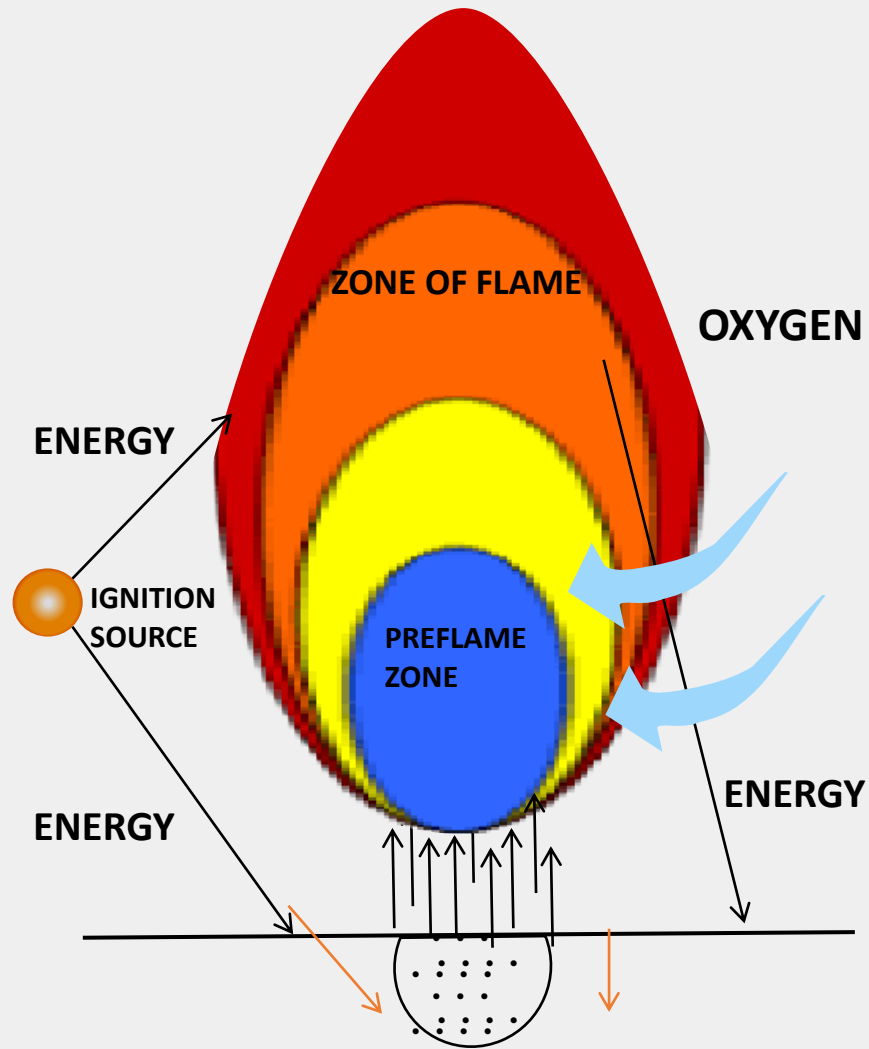
Flame Retardant

- Magnesium hydroxide is a halogen-free, high-resistance inorganic flame retardant, which is especially important for fire protection, disaster prevention and relief of polymer composite materials.
- Magnesium hydroxide is widely used in various low-smoke halogen-free cable materials: thermoplastic low-smoke halogen-free protection.
- Nesting, thermoplastic low-smoke halogen-free insulating material, thermoplastic low-smoke halogen-free oxygen barrier layer, radiation cross-linked low-smoke halogen-free cable material, oil-resistant and UV-resistant low-smoke halogen-free special cable material, low-smoke halogen-free photovoltaic cable material Low-smoke halogen-free nuclear power cable materials and others

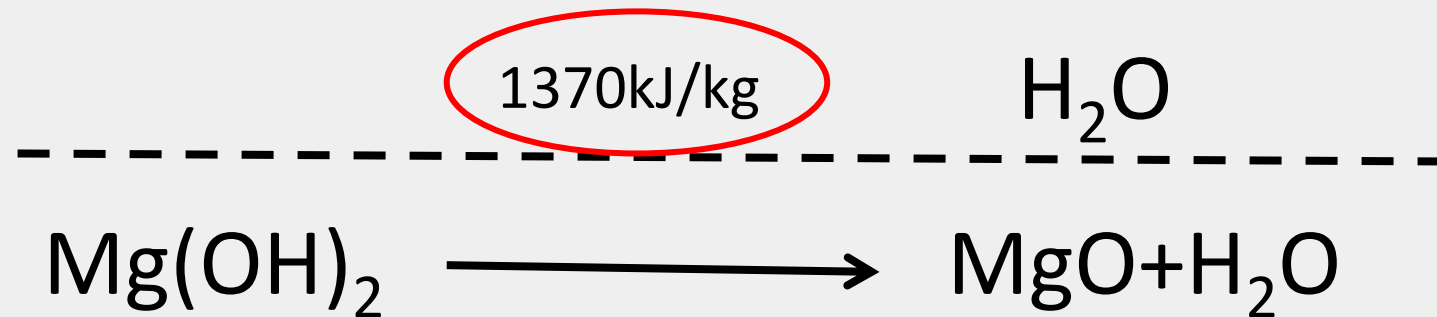


Flame Retardant

MDH working mechanism



- energy consumption
- formation of an oxide layer
- cooling of the polymer surface
- dilution of burnable gases



MDH and ATH

Halogen-free flame retardant compared

(MDH - Magnesium Hydroxide, ATH - Aluminium Hydroxide)



- MDH and ATH are similar when heated. They both create water and metal oxide. Water absorbs heat, and metal oxide covers the surface. But MgO absorb more acid.
- Magnesium hydroxide (MDH) degrades at 340°C, 140°C higher than Aluminum Hydroxide (ATH) does, so MDH is better for plastics needing high temperatures.
- MDH dissociation energy is 1.37kJ/g; ATH dissociation energy is 1.05KJ/g; and thermal capacity of MDH is 17% higher than ATH also. So MDH has higher flame retardant efficiency.
- Magnesium hydroxide with more carbonization which can reduce smoke.
- MDH particle is softer than ATH, so less abrasion during compounding process, which is good for compounding machine.



KMT Global market



- China
- Middle East
- India
- Southeast Asia
- Australia
- Turkey
- Brazil
- Europe (developing)

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Contact Info

Robyn Gai Profile

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ROBYN GAI

- Engineer Magnesium Hydroxide & Brucite Sales
- KMT INDUSTRIAL (HK) LIMITED
- Based in Lanzhou, Gansu Province

**NATURAL BRUCITE &
HIGH PURITY PRECIPITATED MAGNESIUM HYDROXIDE**

Contact: robyn@kmtindustrial.com





Lanzhou Beef Noodles (牛肉拉面)

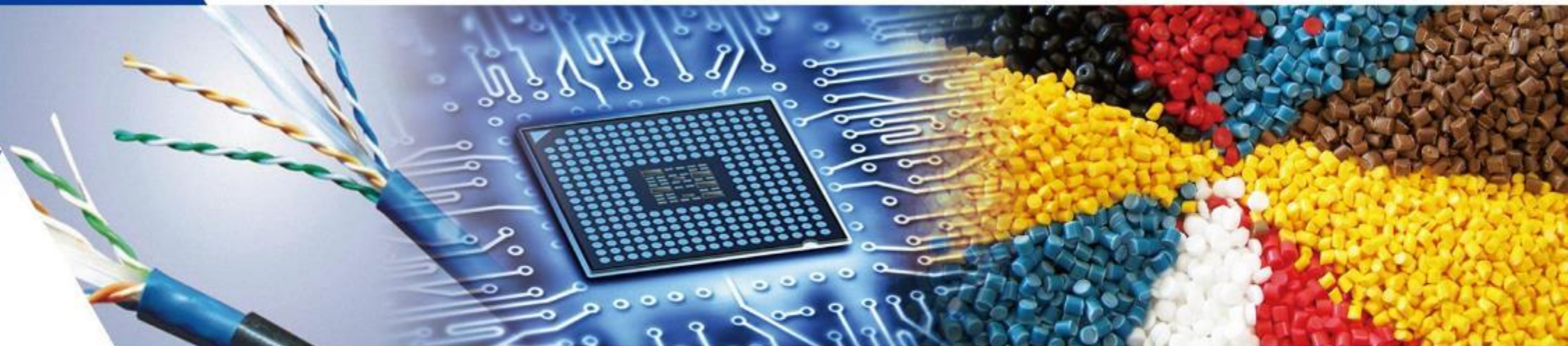
- Lanzhou beef noodles. This sumptuous noodle dish is certainly the most famous in the city of Lanzhou and arguably the most renowned in the whole province of Gansu.
- The recipe emerged during the Qing Dynasty (1644-1912) and was masterminded by a humble, elderly Hui man named Ma Baozi.
- The noodles are dexterously pulled by hand in a matter of minutes before being quickly boiled and then covered in a clear, flavourful soup.
- They are then garnished with tender slices of beef, fragrant coriander, green garlic, crunchy white radish slices, and some red peppers to give them a spicy kick.



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鑫陽礦業集團
XINYANG MINERALS GROUP



2022.02 UPDATE

Introduction to Industrial Products

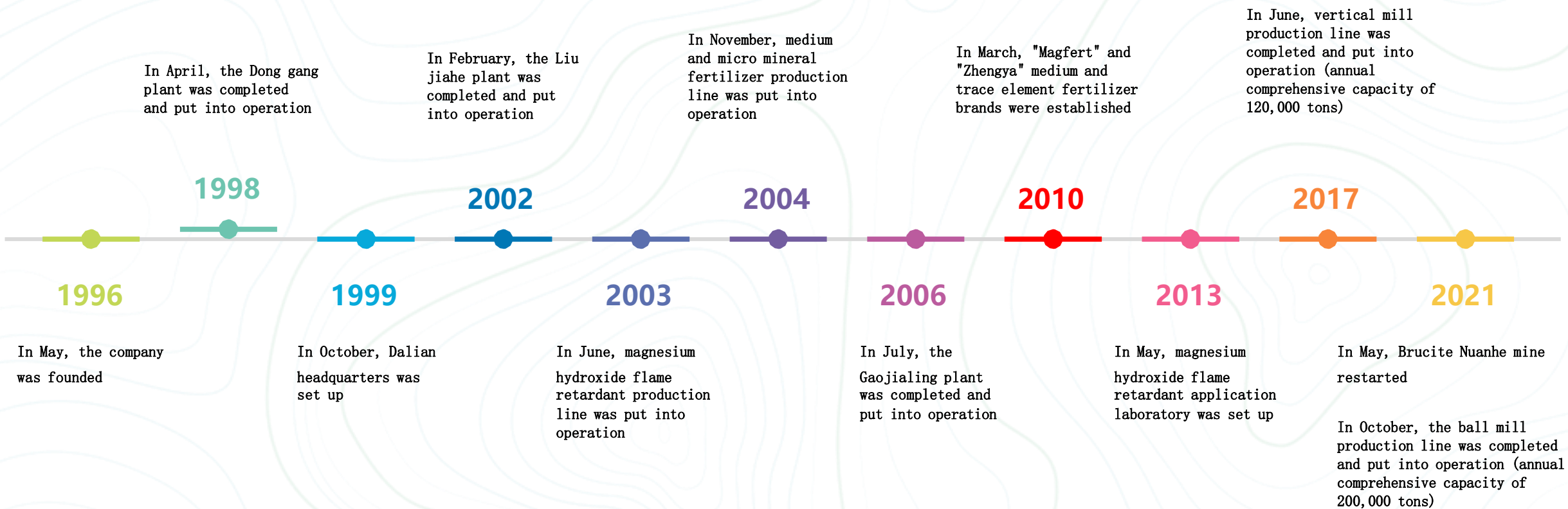
Company Profile



鑫陽礦業集團
XINYANG MINERALS GROUP

Company	XinYang Minerals Group
Date of establishment	May, 1996
Business Content	Brucite related products production and sales Trace & Medium Mineral Element fertilizer production and sales Caustic - Calcined Magnetite production and sales
Registered Capital	Other Non-Metallic mineral product production and sales
Fixed Assets	500 million
Employees	252 people
Production Capability	200000 tons /year
Value of Sales	300 million







Nuan He Mine



Dalian Head office

Address: 46th floor, World Trade Center, 25 Tongxing Street, Zhongshan District, Dalian City, Liaoning Province, China

- Human Resource
- Finance
- Administration
- Sales "overseas & domestic"
- Research and development



Dong Gang Plant

Address: Xiao Si Village in Xincheng district, Donggang, Dandong City, Liaoning Province, China

- Brucite crushing and grind
- Magnesium Hydroxide Flame Retardant production
- Other Non-Metallic Mineral products
- Production Liquid fertilizer production line
- Flame retardant Application Laboratory
- Quality management



Liu Jia He Plant

Address: Liu Jiahe town, Fengcheng, Dandong, Liaoning Province, China

- Medium and Trace Mineral Element fertilizer production
- Special fertilizer production
- Quality management



Gao Jia Ling Plant

Address: Gao Jialing town, Fengcheng, Dandong, Liaoning Province, China

- Light burning magnesium products production
- Dry Magnesium Hydroxide raw material production
- Medium and Micro mineral fertilizer production
- Quality management



Nuan He Mine

Address: jiguan mountain, Nuanhe village, Fengcheng, Dandong, Liaoning Province, China

- Raw ore mining
- Beneficiation of raw ore
- Crushing of raw ore
- Proved reserves of Brucite are above 1 million tons

PROCESSING CAPACITY

加工能力



危险区域
严禁进入

Equipment Configuration



Product line	Product	Number
Raymond production line	60-325 mesh	8

High production efficiency, flexible configuration, Machine able products with multiple grain sizes, suitable for D50 300 μ m ~ D50 7 μ m. It is more suitable for coarse flour production.



Product line	Product	Number
Vertical mill production line	80 -1250 mesh	1

High production efficiency, flexible configuration, can process D50 15 μ m~D50 5 μ m range of a variety of particle size products, to meet the needs of customers in different industries



product

Product line	Product	Number
Vertical mill production line	1250-8000mesh	3

Fine processing superfine powder, which can process D50 2 μ m ~ D50 10 μ m Multiple granularity products in the m-range are more suitable for customers with fine granularity requirements.

Equipment Configuration



Production line	Product	Number
Continuous modification equipment	Stearic Acid modification	2

Continuous modification equipment, high production efficiency, flexible configuration, It can process D50 3μ m ~ D50 15μm Multiple granularity products in the m- range meet the needs of customers in different industries.



Production line	Product	Number
SLG composite modification equipment	The Silane modification	2

The high-speed mixer and continuous modification equipment are coordinated, with high production efficiency and flexible configuration, which can process D50 3 μm~D50 15μm A variety of particle size modification products in the m- range can be used for various modifiers, including liquid and solid, to meet the needs of customers in different industries.



Production line	Product	Number
Ball milling production line	1250-10000 mesh	1

New configuration, multiple specifications can be produced at the same time, the output is efficient, the product quality is stable, the configuration is flexible, and can be processed D50 3 μ m~D50 20μm Multiple granularity products in m interval



SCOPE OF APPLICATION

产品简介、适用范围、原料

Features of natural Magnesium Hydroxide

Flame Retardant products (Powders)

The low smoke & zero halogen Flame Retardant products produced by our company take Brucite natural Magnesium Hydroxide as raw materials. Compared with traditional Flame Retardants, they have the characteristics of high processing temperature, less smoke generation, environmental friendliness, good carbon formation

Applications

- A. Aluminum Composite Panel → Flame Retardant Filler for Aluminum Composite Panel Core Material
- B. Low-smoke halogen-free cable → Flame Retardant filler for Insulation, sheathing compounds
- C. PVC cable → Flame Retardant filler for Insulation, sheathing compounds
- D. Flame Retardant Polyolefin Cable → Flame Retardant filler for Insulation, sheathing compounds
- E. Flame retardant rope and flame retardant tape → flame retardant coating layer

- F. Engineering Plastics → Flame Retardant Fillers
- G. Other resin wires and cables → Flame Retardant fillers
- H. Fire retardant coatings, HotGlue → Flame Retardant fillers
- I. Thermal Shrinkable Material → Flame Retardant Filler
- J. PVC、TPO Waterproof Coiled Material → Flame Retardant Coating Layer
- K. Paper making → Stabilizer for Hydrogen Peroxide
- L. Printed Circuit Board → Flame Retardant Filler



Product raw materials and processing technology

The company uses Brucite ores in Nuanhe Mine as raw material, and produces various specifications of low-smoke halogen-free Flame Retardants through processing technology of picking of Brucite ores、 washing、 drying、 crushing、 ultra-fine grinding、 and surface treatment.

Preferred raw ores with high purity, high whiteness and without asbestos.



Brucite Analysis

Grade	MgO ≥(%)	CaO ≤(%)	SiO2 ≤(%)	Fe2O3 ≤(%)	LOI ≥(%)	Moisture ≤(%)	Whiteness ±1 (%)
Ⅲ	60	3.5	4.5	0.6	30	0.5	88-90
Ⅱ	62	3.0	3.5	0.5	30	0.5	90-92
Ⅰ	64	2.5	3.0	0.4	30	0.5	92-94

Processing Technology





LIST & ADVANTAGES

主要产品列表、优势



List of main products and technical indicators

Name of products	Grade (MgO%)			Average particle size (um)		325 mesh %	Specific surface area m ² /g	CaO%	SiO ₂ %	Fe ₂ O ₃ %	Whiteness	H ₂ O%	surface treatment
		62	64	D50	D97								
BN-R1	✓	✓	✗	8-12	-	-	6-8	≤2.5	≤3	≤0.4	88-90	≤0.5	✗
BN-R2B	✓	✓	✗	≤5.0	17-20	≤0.1	9-12	≤2.5	≤3	≤0.4	90-92	≤0.5	✗
BY-R2B	✓	✓	✓	≤5.0	17-20	≤0.1	9-12	≤2.5	≤3	≤0.4	90-92	≤0.4	Stearic acid
BQ-R4B	✓	✓	✓	≤3.0	10-12	≤0.1	11-13	≤2.5	≤3	≤0.4	92-94	≤0.4	✗
BY-R4B	✓	✓	✓	≤3.0	10-12	≤0.1	11-13	≤2.5	≤3	≤0.4	92-94	≤0.4	Stearic acid
BG-R4B	✓	✓	✓	≤3.0	10-12	≤0.1	11-13	≤2.5	≤3	≤0.4	92-94	≤0.4	Silane
BH-R4B	✓	✓	✓	≤3.0	10-12	≤0.1	11-13	≤2.5	≤3	≤0.4	92-94	≤0.4	Organic Carboxylate

- BY series products use advanced fatty acid to carry out special treatment on the surface of magnesium hydroxide, and the coating rate can reach more than 99%. The ultra-high coating rate increases the dispersibility of Magnesium Hydroxide in the polymer material and reduces the influence on the processing properties and mechanical properties of the material.
- BG series products use special silane coupling agent to treat the surface of Magnesium Hydroxide. It can achieve the purpose of high filling, halogen-free flame retardant, and meet the multiple requirements of customers such as high performance and low cost. The product has no white spots, no bubbles, and high anti-cracking index.
- BH series products use special organic carboxylate to treat the surface of Magnesium Hydroxide through special processing technology. It can greatly improve the mechanical properties and processing properties of polymer materials. With high thermal stability, this series of products can be used in a high ratio with aluminum hydroxide in low-smoke halogen-free cable materials to reduce the production cost of cable materials.

Product Advantages



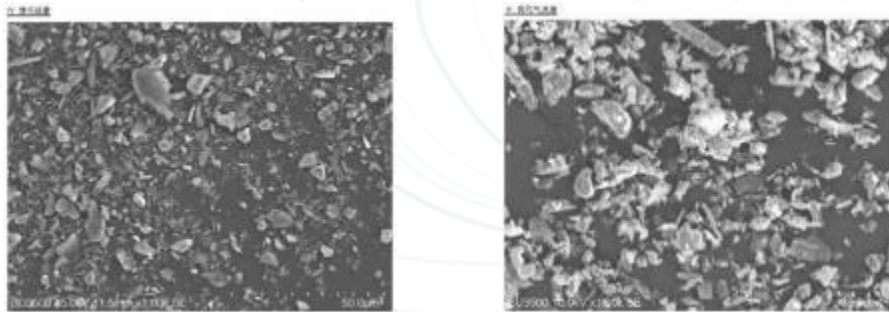
Advantage 1: According to the special requirements of customers, we can supply high level customized Magnesium Hydroxide Flame Retardant products with higher Magnesium Hydroxide purity, less impurities, higher whiteness and lower free iron content through the method of raw ores washing, drying, and man+machine picking the ores.

Actual test data of high-end customized Flame Retardant products

MgO %	Mg(OH)2 %	SiO2 %	CaO %	Fe2O3 %	L.O.I %	Ferric iron (ppm)
64.5	93.8	2.18	2.24	0.21	30.41	120

Advantage 2: Our company first adopts "ball milling + classification" ultra-fine powder grinding technology in this industry. Compared with the Flame Retardant products made by the traditional jet mill grinding, it has the characteristics of high spherical particle size, narrow particle size distribution and good dispersibility. It can further improve the product processing performance, mechanical properties and stability of our Flame Retardant products in the applications of downstream customers.

Comparison of Electron Micrograph for ball mill and air jet mill super fine Flame Retardant products



Advantage 3: Our company adopts a special particle size control technology, the particle size distribution of D50 3um ultrafine flame retardant products is narrower, D97 can be controlled between 10-11um, and the sieving residual rate of 325 mesh can be controlled below 0.01%. Stable particle size control enables our flame retardant products to have better product processing performance and mechanical properties in the applications of downstream customers.



Flame Retardant material performance test formula based on low smoke halogen-free cable compound test formula

TEST No.	Addition amount of low smoke halogen-free flame retardant (by mass)					Resin input (quantity by mass)		Amount of other additives added (by weight)		
	Aluminum Hydroxide	BQ-R4B	BY-R4B	BG-R4B	BH-R4B	Basic resin	Compatibilizer	Coupling agent	Lubricant	Antioxidant
TEST I	165	x	x	x	x	88	12	2	3	1
TEST II	120	45	x	x	x	88	12	2	3	1
TEST III	120	x	45	x	x	88	12	2	3	1
TEST IV	120	x	x	45	x	88	12	2	3	1
TEST V	120	x	x	x	45	88	12	2	3	1

Test Result

TEST No.	Tensile strength MPa	Elongation at break %	Melt index (150°C, 21.6Kg)	Oxygen index %
TEST I	12.8	215	4.32	36
TEST II	11.5	240	6.18	39
TEST III	13.1	175	4.03	37
TEST IV	12.6	220	4.05	38
TEST V	11.9	240	5.62	37

Test equipment and test piece





RESEARCH & DEVELOPMENT

品质管理及研究开发

Quality Assurance

Our company always aims to provide customers with safe, stable and high-quality products, and adheres to the whole process quality management system of raw material inspection, production and engineering inspection, and product delivery inspection.



The test equipment adopted by our company can conduct all-round detection on various indicators and performance of the powder to ensure the stability of the product.

experimental program	Measuring instrument
qualitative analysis	X - line
quantitative analysis	Firelight X-ray analysis device
electron microscope	electron microscope
colour analysis	Colorimeter
Whiteness	Whiteness tester
Particle size analysis	Particle size analyzer
Passing rate	standard sieve
P H	PH meter
moisture	Moisture dryer
Friction degree	Friction tester
Specific surface area	Specific surface area measuring machine
viscosity	BH, BL, LVT
Interface analysis	Interface analyzer

Our product research and development laboratory is equipped with multiple sets of small and medium-sized test equipment, which can be targeted to develop new products according to customer requirements; The Flame Retardant polymer material laboratory can conduct comprehensive mechanical, Flame Retardant and comprehensive performance tests of downstream products, and also conduct qualitative analysis and quantitative research on problems in the production process of downstream customers, so as to provide customers with efficient and accurate technical service guarantee.



Laser particle distributor



Electronic universal testing machine



Shore hardness tester



High speed mixing modifier Horizontal and vertical combustion meter



Oxygen index tester



Melt indexer



Double roll open mill



Densitometer



Flat curing press

Marketing Network





鑫陽礦業集團
XINYANG MINERALS GROUP



Darren Dong

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Dalian,116001,Liaoning PR.,China



HQ in Dalian



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Group Introduction

- The Xinyang Minerals Group, approved by the Ministry of Foreign Trade & Economic Cooperation, is a comprehensive enterprise group that specializes in mine opening, mineral processing, flame retardant powder production, environmental pollution treatment, mineral fertilizer production, import & export trade, scientific research and owns hundreds of innovation patents.
- The group owns numerous non-metallic mines, including brucite, magnesite, marble, potash feldspar, dolomite, chlorite and wollastonite.
- It also mines and owns a premium brucite mine with large reserves operated by Dandong Xinyang Mineral Co. Ltd. Resources of brucite are estimated 4.0 million tonnes.
- The Group has become a leading supplier of brucite ores and magnesium hydroxide superfine powder flame retardant in China.
- The Group has established an entire industrial chain, ranging from mine opening to refined processing, from technology research and development of downstream services.

BRUCITE MINE



NUANHE BRUCITE MINE

- The mine has 4.0 MT of brucite resources
- An important producer of brucite in China
- The mine is located in Jiguanshan Town, Fengcheng City.





RESEARCH INSTITUTE

- The group company has Xinyang Mining Donggang Chemical Research Institute and Xinyang Mining Dalian Chemical Research Institute. At present, the Group's physical and chemical laboratories have established long-term and stable technical R&D cooperation with Shanghai Jiaotong University, Dalian University of Technology (DUT, Dalian Maritime University, Dalian University of Technology and other universities, and carried out special technical cooperation with Shanghai Cable Research and Tianjin University Papermaking Laboratory Research Unit.
- The Group also employs Korean industrial technology experts and Japanese agricultural technology experts as consultants in the company's industrial and agricultural fields. It has long been committed to the research and development of new products, process improvement, product upgrading and downstream application technology of brucite industry and agriculture.
- The group currently uses the fine grinding of brucite, stearic acid modification and silane modification process. It adopts German designed equipment and Korean processing technology to reach the world-class and international level.



- Dandong Xinyang Mineral Co.,Ltd is an enterprise with more than 30 years of export experience of magnesium products. We have accumulated rich overseas sales channels and customer resources, and supply overseas customers with a variety of magnesium products, including raw ore, fertilizer granular, flue gas desulfurization product, ultra-fine powder flame retardant, etc. The annual export income of 2018 is about 300 million RMB.
- For all these years, Adhering to R&D theory of embracing the best, co-working, and continuous innovation, Dandong Xinyang Mineral Co., Ltd has built long-term collaboration with multiple overseas terminal clients.
- Together we carried out a lot projects in specific fields, with Japan customers we have liquid fertilizer projects, soil restoration project, soilless cultivation project; with South Korea customers we have ultra-fine powder production technology cooperation projects, with European customers we have the papermaking technology cooperation projects and the project of flame retardants formula and co-operation.
- With more than 30 years' collaboration with overseas clients through the international trade department, Xinyang group becomes the leader in China brucite market regarding research and development, process and downstream application technology.



BRUCITE ORE:

CaO: 1.5%-4.0% max
SiO₂: 2.0%-5.5% max
L.O.I: 29%-31% max
SIZE :0-7mm, 10-50mm, 10-150mm
PACKING: In bulk or in 1 MT P.P bag



BRUCITE POWDER:

MgO: 60%-65% min
CaO :1.5%-4.0%max
SiO₂ :2.0%-5.5%max
L.O.I: 29%-31%max
SIZE: 120mesh, 200mesh 325mesh,
400mesh
PACKING: In 1 MT P.P bag



CAUSTIC CALCINED BRUCITE:

MgO: 85%-92% min
CaO: 2%-3.5% max
SiO₂: 3%-4.5%max
LOI: 3.5%-6.5%max
SIZE: 0-10mm, 10-50mm, etc
PACKING: In bulk or in 1 MT P.P bag



CAUSTIC CALCINED BRUCITE POWDER:

MgO: 85%-92% min
CaO: 2%-3.5% max
SiO₂: 3%-4.5% max
L.O.I: 3.5%-6.5% max
SIZE: 0-10mm, 10-50 mm, etc
PACKING: In 1 MT P.P bag



CAUSTIC CALCINED BRUCITE POWDER:

Applications:

used as refractory material, optimal raw material for magnesium refinery, flame retardant products, raw material for fertilizer, excellent soil conditioner

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Brucite+

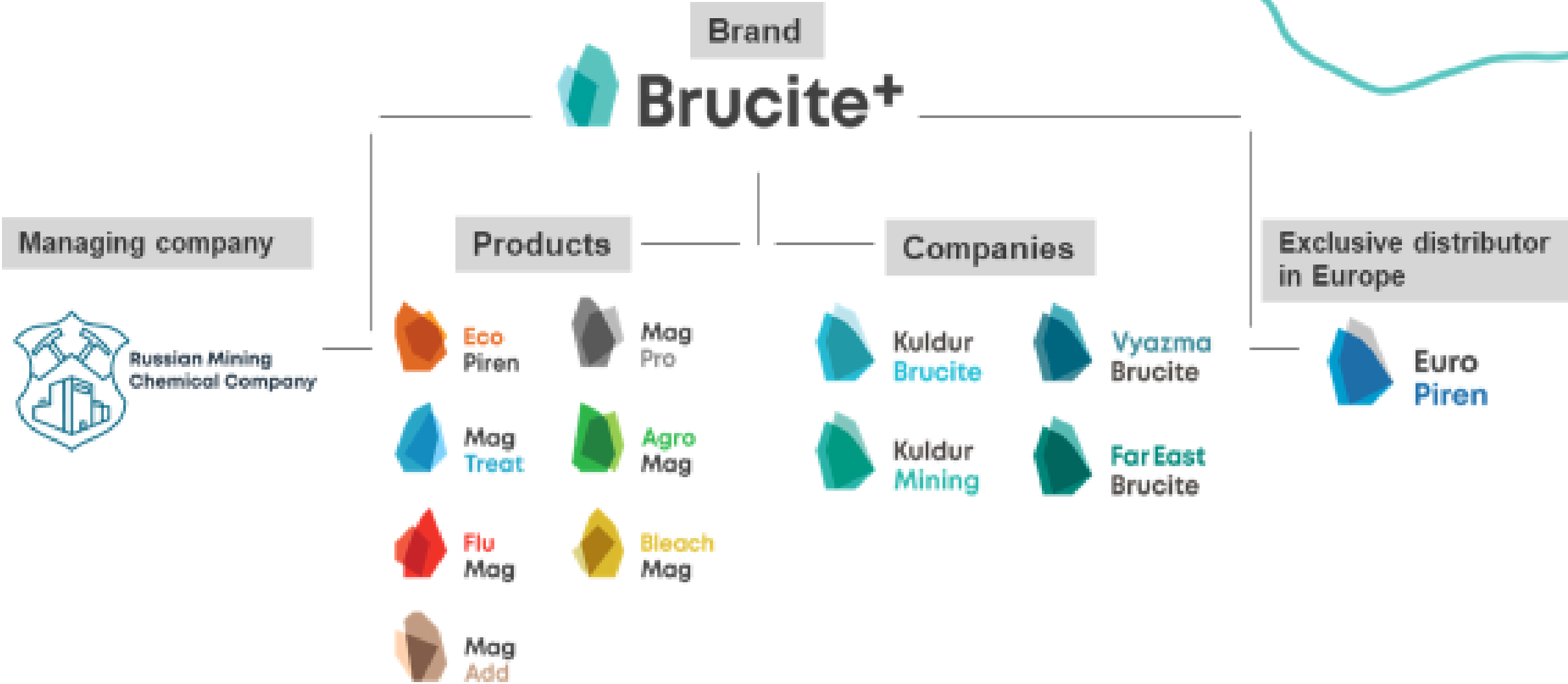
Business overview

 **Brucite+**



Structure

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Mineral brucite

Brucite is a naturally-occurring mineral form of magnesium hydroxide, and forms the main component of brucite ore.

It was first described in 1814 and was named in 1818 after the American mineralogist A. Bruce (1777-1818).

In its pure form the mineral is made up of MgO (69.12%) and H₂O (30.88%). It has the highest magnesium content of the various magnesium-based minerals used in industrial applications.



Brucite formation

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Brucite is formed through thermal decomposition of dolomite:



It can also be formed through thermal decomposition of magnesite to form periclase (MgO), which is subsequently hydrated to form the **hydroxide**:



Main Applications of milled (ground) brucite

Agricultural

Rubbers&Tires

Pulp&Paper

SMC/BMC composites

Flame Retardants

Environmental

Steelmaking

Magnesium derivatives

Production facilities

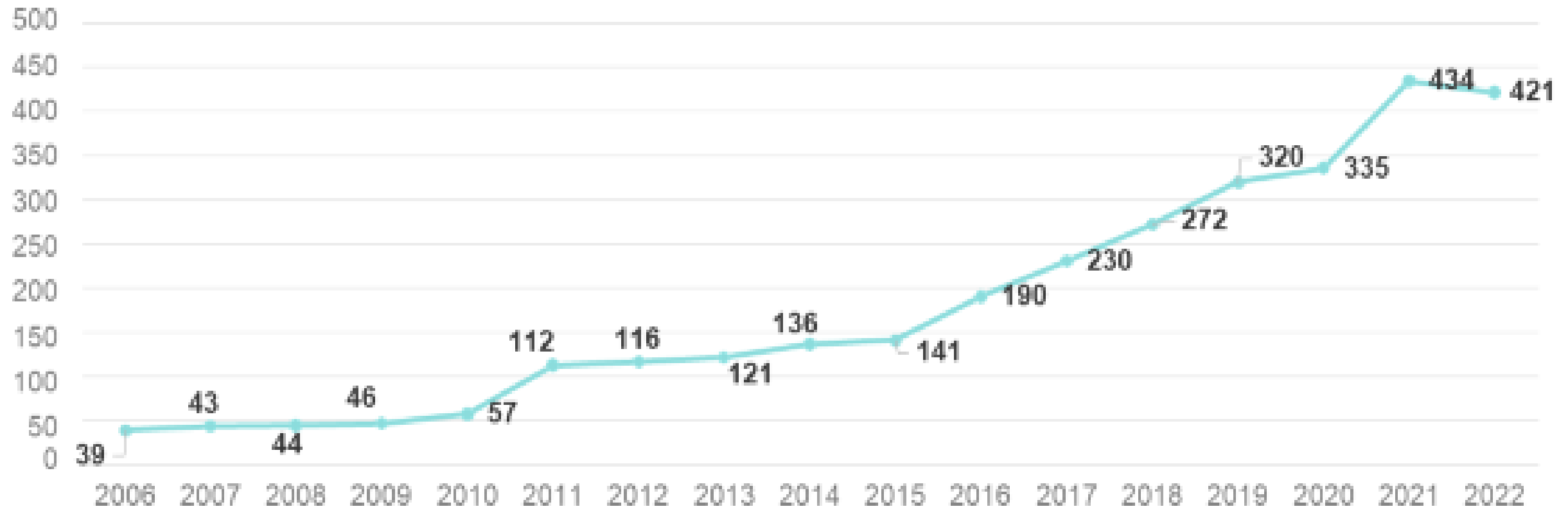


- Production of end-products from natural magnesium hydroxide ore
- Production is done by three milling plants. Total production capacity is 180 kt of milled products annually
- Two laboratories, R&D center
- The plants is equipped the up-to-date technology equipment to provide manufacture of high-quality products
- Production is done in accordance with the certificate of compliance of quality management system ISO 9001:2015 and the certificate of ecological management ISO 14001:2015



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Volume of sales 2006-2022, thousand tons



Kuldur deposit



- Extraction of brucite ore with high chemical purity
- Location - Jewish Autonomous Region, Russia
- Reserves - about 6.4-6.9 million tons (3.9 million tons according to the State Commission for Reserves and 2.5-3.0 million tons of expected increase)
- 14-15 years of operation
- Commencement of operations - 1969
- Extraction volumes - 460,000 tons a year
- Mining type - open cast
- Low carbon emissions caused by the extraction of brucite on the basis of the FCA Kuldur deposit (9 gCO₂e per 1 kg of ore)

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Kuldur deposit


Current state of affairs

- A modern crushing and sorting plant is built.
- A new technology of X-ray absorption (XRT) beneficiation is introduced.
- A new quality control laboratory is built.
- Work continues on the revaluation of the mineral resource base of the deposit towards an increase of 2.5-3.0 million tons.
- Based on the results of the routes in 2022, within the Kuldur area, northwest of the Kuldur deposit, prerequisites were obtained to identify additional prospects for the growth of reserves. With the task of clarification, it is planned to carry out search routes on the western flank of the Kuldur area in 2023.

Ore beneficiation



Brucite+ uses advanced ore beneficiation technologies.

- In 2022, a crushing and processing plant was launched and X-ray absorption (XRT) beneficiation technology was introduced
-  Increase in the productivity of the enterprise and in the share of products of high chemical purity and quality with a low content of impurities.

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Savkinsky deposit



- Currently the largest known brucite deposit anywhere in the world by volume of reserves
- Location - Jewish Autonomous Region, Russia
- Reserves - about 36 million tons (19 million balance reserves and 17 million tons off-balance reserves)
- 26 years of operation
- Commencement of operations- 2027
- Extraction volumes – 1,35 million tons a year



Savkinsky deposit

Current state of affairs



- In April 2020, a 21-km long road was built in the Obluchensky District
- By May 2021, temporary living quarters for employees have been constructed
- By March 2021, subsurface exploration of the Savkinsky deposit had been completed
- Preliminary estimates showed that high-grade products could be produced from brucite beneficiation.
- At present, geological exploration (exploratory stage) is being carried out with the task of preparing for the substantiation of a feasibility study of permanent exploration conditions and a general calculation of the deposit's reserves in categories C1+C2.
- Work continues to substantiate a set of grades of the deposit with the aim of obtaining the greatest economic effect from the development of the deposit.
- Sideline development of small and poorly explored deposits of magnesite raw materials is carried out

Sustainability

Eco-friendly raw materials

The emissions caused by the extraction of brucite on the basis of the FCA Kuldur deposit tend to zero, amounting to 9 gCO₂e per 1 kg of ore.

Eco-friendly products

- Products made from natural raw materials;
- Low CO₂ emissions from MagTreat® products.

Environmental application








Water and gas treatment, fire safety, fertilizers and feed additives without pesticides and antibiotics.

Environmental management

Brucite+ has implemented an environmental management system based on the requirements of the international standard ISO 14001: 2015.



Products and applications

Product	Form	Application
 EcoPiren	White powder	Flame retardant in plastics
 AgroMag	White powder, granular, suspension	Anticaking agent, magnesium fertilizer, animal feed additive
 BleachMag	White suspension/powder	Pulp bleaching agent
 FluMag	Lump material	Foundry flux
 MagTreat	Suspension, powder, ground material	Waste water treatment, flue gases desulphurization, odor control
 MagPro	White powder, paste	High active MgO for rubber compounds
 MagAdd	White powder	Raw material for the production of a broad range of magnesium based products



EcoPiren details

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- *The main areas of application of EcoPiren[®] are in the production of cables (HFFR and PVC), aluminium composite panels and roofing membranes (bitumen and TPO), engineering plastics.*
- EcoPiren[®] imparts flame retardancy to polymer compounds, reduces smoke emission and prevents the formation of burning droplets during combustion.
- The application of EcoPiren[®] achieves the highest grades of fireproof classifications in polymer systems.
- The high decomposition temperature of EcoPiren[®] (330 °C) allows the processing of materials at elevated temperatures, significantly increasing the productivity.
- EcoPiren[®] is produced in the form of a powder, with a median (D_{50}) particle size from 3.5 to 200 μm and can be treated/coated with stearic acid, alkylsilane, vinylsilane or aminosilane.
- EcoPiren[®] can be supplied in different purities to suit the flame-retardant application.

AgroMag details



- *The main applications of the AgroMag[®] product line is in the production of fertilizers and fertilizer mixtures for the agricultural industry, feed and premixes for livestock.*
- AgroMag[®] contains a high amount of magnesium (up to 41.68%) compared to other industrial magnesium minerals
- **Product shape** –granules, powder, liquid aqueous suspension

BleachMag details



- *The main applications of BleachMag[®] are in the pulping process and pulp bleaching.*
- BleachMag[®] acts as an alkali, a stabilizer of hydrogen peroxide and a protector of cellulose in chlorine-free bleaching of cellulose fiber.
- Also, it completely replaces magnesium sulfate in oxygen delignification of cellulose.
- BleachMag[®] acts as a cooking base in the sulphite and bisulphite pulping process. Due to its lower molecular weight compared with alkalis on the market, BleachMag[®] reduces the alkali consumption per ton of pulp produced.
- BleachMag[®] is produced in the form of a suspension and as a powder. The powders and suspension have a median (D_{50}) particle size 5,5 μm . BleachMag[®] is produced from the highest quality brucite ore with a low iron content



MagTreat details

MAGFORUM 2023



- *The main applications of MagTreat® include wastewater treatment, marine exhaust gas cleaning in scrubbers and flue gas desulfurization.*
- MagTreat® can replace other alkalis on the market making use of its natural buffering effect (pH 9.5) and controlling the aqueous effluent and gases that enter water courses and the atmosphere within the specified limits. Divalent magnesium cations contribute to the improvement of the coagulation properties in wastewater treatment, improving filtration, also forming a valuable by-product during flue gas desulfurization.
- MagTreat® is produced in the form of a powder, a suspension and a granular product. The powders and suspension have a median (D_{50}) particle size from 5,5 to 10 μm , the particle size of the granular product used as filtration media ranges from 0,5 to 4,0 mm.



MagPro details

MAGFORUM 2023



- The main applications of MagPro® include the production of rubber compounds and rubber technical products based on halogenated rubbers, pneumatic tire parts, rubber cable sheathing and adhesives. It can also be used in the production of SMC/BMC composites based on polyester and epoxy resins.
- MagPro® is used in rubber compounds as an acid scavenger, scorch controller, curing agent and heat stabilizer. The function of MagPro® in the production of SMC/BMC composites is as a thickening agent (chain extender).
- MagPro® allows the processing of halogen-containing rubber compounds safely at high temperature, avoiding scorching and significantly increasing the productivity of the process. MagPro® has a high surface area of 130-170 m²/g and a median particle size D₅₀ of 7-8 microns.
- In order to comply with contemporary environmental requirements, special packaging of MagPro® is available in pre-weighted 1 kg sachets made of low melting point EVA film (75°C). This allows loading of the sachets directly into the rubber mixer avoiding dust and unnecessary handling.
- Two grades are available: MagPro® 150 and MagPro® 170.

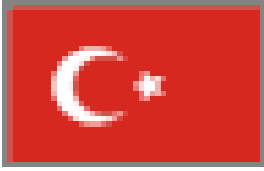
MagAdd details



- *The main areas of application of MagAdd® include the production of magnesium salts such as sulfate, nitrate, chloride, and stearate as well as many other magnesium-based products.*
- Brucite mineral has a high magnesium content (up to 41.68%) and a low level of impurities compared with other minerals and therefore is an ideal raw material for the production of various magnesium products.
- MagAdd® is produced in the form of a powder with median particle sizes (D_{50}) from 10 to 50 μm and is available in various packaging

Benefits of a cooperation with Brucite+

- Long term security of supply due to vast reserves of brucite ore, high production capacity and a large and specialized distribution network
- An environmentally friendly approach to mining and production
- Improved cost/performance ratio of your end products
- Strictly controlled consistent quality
- Wide range of packaging options
- Technical support, both in development and production



Likya Minerals Turkey

MAGFORUM 2023

- Reserves of huntite and hydromagneiste are found in the Çameli Basin.
- Age is estimated at 2 - 3 million years.
- Resources estimated at 10 million tonnes
- Formation of the deposit is a result of three factors
 1. Depositional area of magnesium rich ultramafic basement rocks
 2. Lake environment which evolves into a basin
 3. Tectonic activity to allow magnesium rich hydrothermal solutions to reach the surface

Source: LKAB website

UltraCarb Products

- UltraCarb is a natural halogen-free fire retardant mineral from a deposit of Hydromagnesite and Huntite. Both minerals are flame retardants on their own but a combination of the two is fine.
- UltraCard is used as a fire retardant filler in a wide range of polymers
- Next slide shows a three stage fire retardant mechanism of UltraCarb



1. Classical endothermic fire retardant functionality
2. PLUS it releases carbon dioxide
3. PLUS it provides char stabilisation.

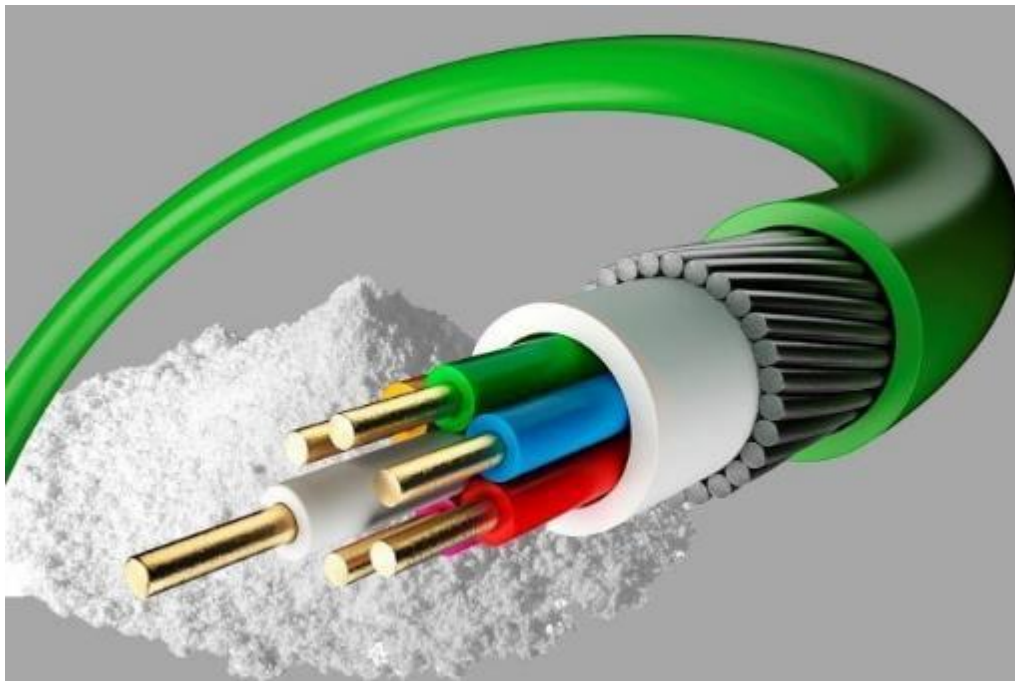
We call this the **three-stage fire retardant mechanism**. This multi-process fire retardancy offered by UltraCarb:

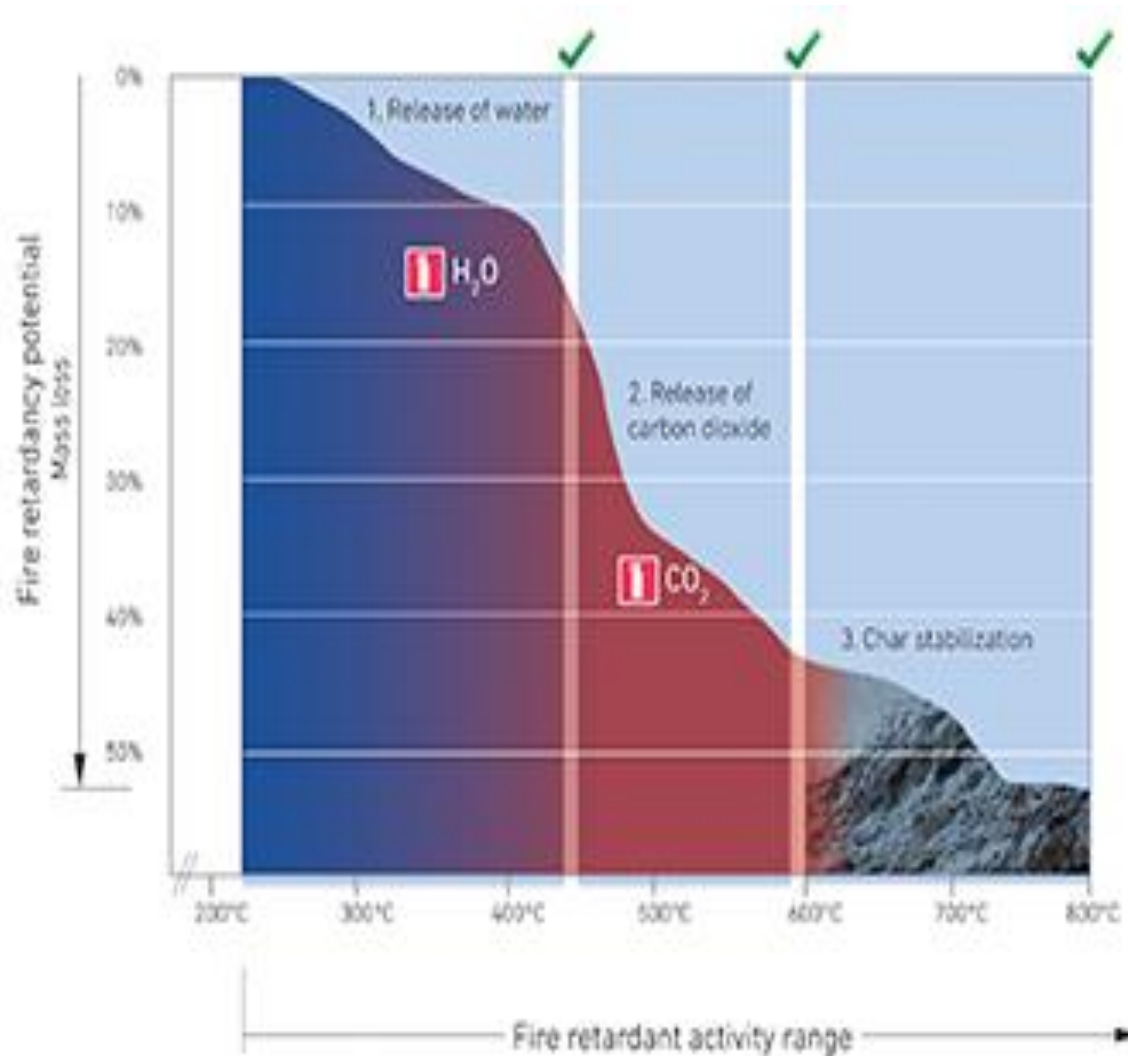
- releases water at approximately 220°C
- releases carbon dioxide at about 450°C
- and finally, formats the char stabilisation.

This extended fire retardant activity range is what makes UltraCarb so unique. UltraCarb is:

- halogen-free
- versatile
- effective
- cost efficient

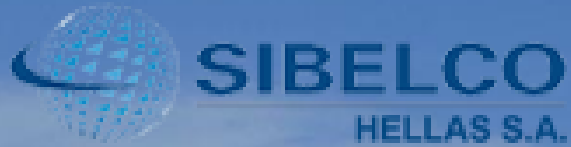
LKAB manufacture the unique UltraCarb product range from their own Turkish source of Hydromagnesite and Huntite (HMH)





1. Water is released at $\sim 220^\circ\text{C}$ (thermal decomposition)
2. CO_2 released at $\sim 450^\circ\text{C}$
3. At $\sim 560^\circ\text{C}$ UltraCarb particles accumulate at the surface of the burning polymer to form a stable char which inhibits combustion

- Hydromagnesite and huntite, along with aragonite, are formed in closed lacustrine basins of Tertiary to recent age
- The formation of Mg-rich minerals in closed basins is commonly related to an ultramafic and/or dolomite source
- Two examples of Hydromagnesite and Huntite operating deposits are in Greece and Turkey. Other occurrences are in British Columbia (Atlin) and Serbia (Bela Stena)
- The main mechanism is the dissolution of the Mg-silicates in the catchments and precipitation of Mg^{2+} in the form of Mg-and/or Mg-Ca carbonates in a closed hydrological system
- The two operating mines are Sibelco Hellas S.A Mining Company (Greece) and Likya Mining Company (LKAB), Turkey
- Both Companies, Sibelco Hellas S.A. in Greece and LKAB Likya Mining Company in Turkey will be carrying out drilling programmes to increase reserves.



HUNTITE-HYDROMAGNESITE MINED AND AFTER PROCESSING
HAS A MIXTURE OF 60% HUNTITE: 40% HYDROMAGNESITE

THICKNESS 3-4 metres
MINES: NERAIDA KOZANI
PLANT: LEFKARA KOZANI
RESERVES: 500,000 tonnes
MINING: MAY-SEPTEMBER

Courtesy: Professor Stamatakis



SOFT POROUS MUDSTONE OF DOLOMITE AND CLAY MINERALS

HUNTITE - HYDROMAGNESITE MIXTURE



MAGFORUM 2023

Courtesy: Professor Emeritus Stamatakis



Hydromagnesite- Huntite



Mine at Neraida Kozani

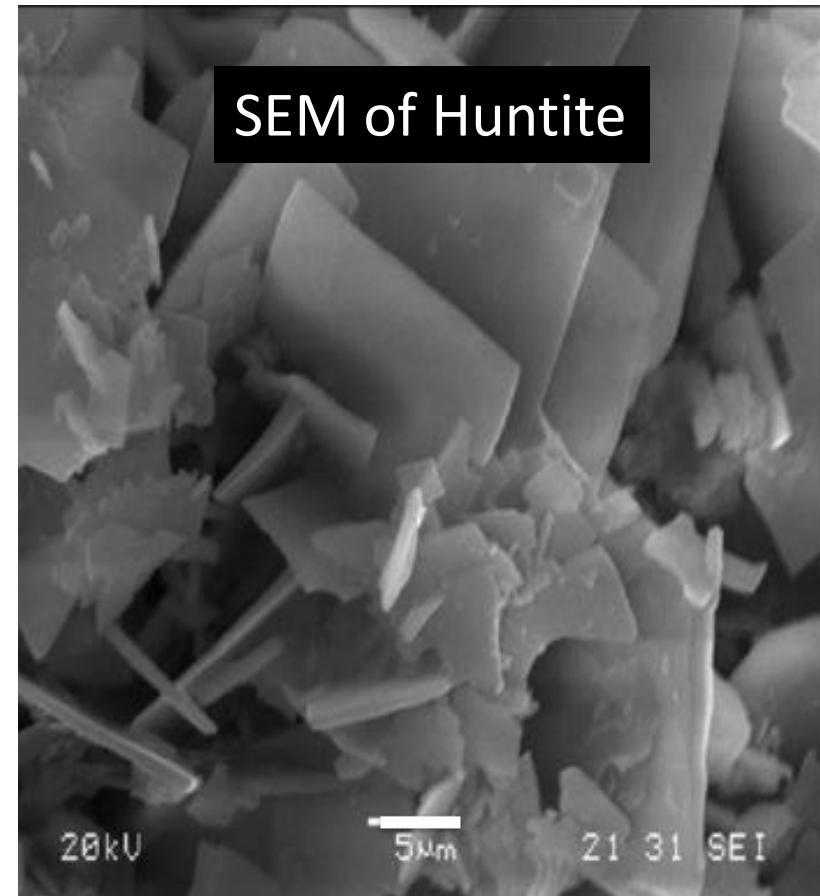


Plant at Lefkara Kozani

Huntite and Hydromagnesite Products

- **Huntite Products / Portafill H5**
 - High brightness 94-96%
 - Low iron (<0.01%)
 - Platy nature
 - Used in paint

- **Hydromagnesite Products / Securoc C10**
 - Used in a mix with plastic materials for insulation of special cables
 - A fire retardant and flame retardant



Courtesy: Prof M.Stamatakis

YEAR	2020	2021
MINED	18,980	16,720
PROCESSED	5,674	5,544

- **SALES OF HUNTITE-HYDROMAGNEISTE (60:40%)
FLAME RETARDANTS IN PLASTICS/WIRES AND PAINT**

*Association of SME Greece. Issued late 2022
Source: Professor Emeritus Stamatakis, University of Athens*