

Gypsum, a commitment to
sustainability and the environment

As global warming is becoming an increasing concern, and considering that energy intensive cement production accounts for around 8% of global carbon dioxide (CO₂) emissions, integrating environmentally friendly building materials, such as gypsum, into building projects helps to reduce greenhouse gas emissions.

Gypsum is one of the most versatile and sustainable building materials. The CO₂ footprint of gypsum is very low, it occurs naturally and is also generated as a by-product of power stations, as well as the fertilizer and detergent industry. Gypsum is infinitely recyclable (albeit some energy is used in its processing and transportation). With its low carbon footprint and high availability, Gypsum enables builders and architects to achieve green building objectives associated with the transport, fabrication, recycling and disposal of building materials.

Experience
the difference

Gypsum offers many additional benefits as a building material due to its superior performance. Prefabricated boards or blocks of the raw material allow for faster construction of fire-resistant interior walls and divisions, which offer thermal and sound insulation as well as room moisture balance for increased everyday comfort in both public and private buildings. Gypsum based levelling plasters and decorative finishes also offer the same advantages. Large joint-free gypsum based floor levelling compounds speed up the finishing process and are ideal for use with underfloor heating systems or in colder climates. The versatility of gypsum based materials also enables architects, building owners and decorators to design attractive features for modern interiors.

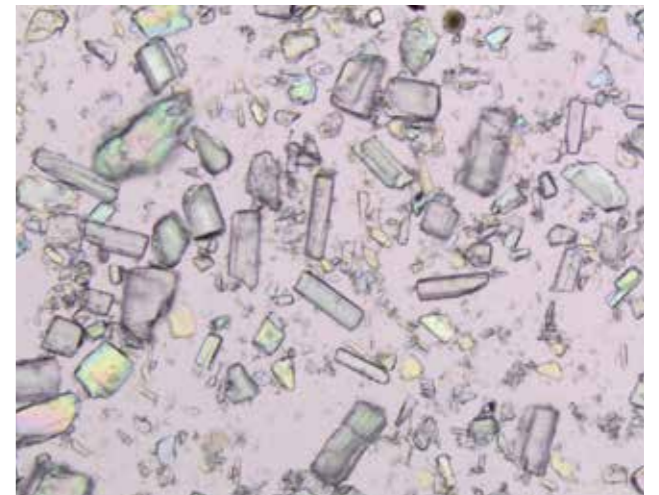
Gypsum is characteristic of sustainable building and is readily incorporated into green building projects. The use of gypsum products modified with AkzoNobel Performance Additives enables users to formulate finished products with very low VOC emissions in compliance with stringent environmental standards, e.g. European eco-labels such as EMICODE EC1^{PLUS} and Blue Angel. In addition, credit can be earned for LEED certification as well as for improved indoor air quality.

Gypsum is mineral calcium sulphate, its chemical name being calcium sulphate dihydrate ($\text{CaSO}_4 \cdot 2 \text{H}_2\text{O}$). Different types of gypsum can be produced by changing the temperature of the calcining process and the way in which it is carried out:

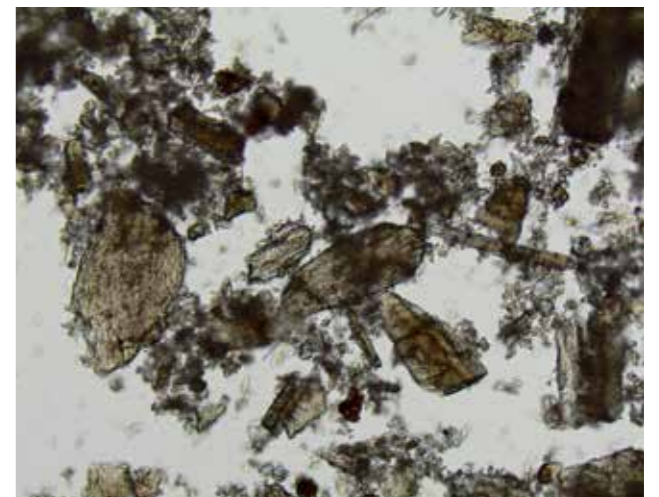
1. α -calcium sulphate hemihydrate ($\alpha\text{-CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$) produced via an autoclave process at a temperature of around 100–150°C:
 - a. Crystalline structure requires less mixing water, delivers higher final strength.
 - b. Used for moulding plasters and floor trowelling and levelling compounds.
2. β -calcium sulphate hemihydrate ($\beta\text{-CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$, Bassanite, Stucco) is produced at 130–160°C in a rotary kiln or kettle:
 - a. Amorphous structure requires more mixing water, delivers lower strength.
 - b. Used for plastering applications and filling compounds.
3. α -Anhydrite III ($\alpha\text{-CaSO}_4$) from autoclave production and β -Anhydrite III ($\beta\text{-CaSO}_4$) from rotary kiln or kettle production:
 - a. Formation starts at temperatures of around 100°C, fast formation of hemihydrate phases.
 - b. Used for plastering applications.

4. Anhydrite II (CaSO_4) comes in 3 types (Anhydrite IIs, IIu, IIE) and is produced at temperatures of over 200°C:
 - a. Slow formation of insoluble hydrate phases.
 - b. Used in screeds (must be accelerated).
5. Anhydrite I (CaSO_4) is produced above 1180°C:
 - a. Used as an additive in screeds.
6. Multiphase gypsum is produced by modern calcination processes and includes all kinds of calcium sulphates.

Over the last few decades, synthetic gypsum has increasingly been used in modern building materials. Most of the synthetic gypsum used is a by-product of electricity production in coal-fired power plants. During the production of power, a large amount of flue-gas desulphurisation gypsum (FGD) is produced as a result of pollution treatment. Other synthetic gypsums, by-products of different chemical processes, include Phosphor gypsum, Titan gypsum, Citro gypsum and others, and are of lower importance for the building and construction industry. Synthetic gypsum is mostly used in plaster and fibre boards.



Alpha lamda crystalline structure



Beta lamda amorphous structure

Main gypsum based building materials in construction

Plasters

In today's very demanding construction market, buildings must be finished more quickly, at a higher quality and with longer durability, all at a reasonable cost and using sustainable materials. Gypsum based materials are ideal for this.

Gypsum based building plasters

Plasters based on gypsum or combination of gypsum and hydrated lime are commonly used for levelling of interior walls and ceilings. Increasingly, these plasters are applied by spray machines to increase the efficiency. In parallel, the use of drymix mortars for this application is growing at the expense of admixtures made on building site.




Gypsum based smoothing or decorative plasters

Gypsum based or calcium carbonate (CaCO₃) based smoothing or textured products are commonly used decorative purpose of interior surfaces. The final wall and ceiling surface can be either very smooth or can have a decorative pattern. Drymix mortar products can be either fast setting (gypsum based) or slow setting (calcium carbonate based with a high polymer powder binder content). Furthermore, slow setting products are also available in the form of ready-to-use pastes, based on calcium carbonate with a high liquid polymer binder content.



Redispersible Polymer Powders

●●● = excellent ●● = very good ● = good

Product	ELOTEX®	AD0110	MP2100 
Technical Information	Chemical base	VA	VAE
	MFFT (°C)	5	3
	VOC Eimcode Class	EC1	EC1 ^{PLUS}
Applications	Gypsum based building plaster, hand applied	●●●	●●●
	Gypsum based building plaster, machine applied	●●●	●●●
	Gypsum – lime building plaster, hand applied	●●●	●●●
	Gypsum – lime building plaster, machine applied	●●●	●●●
	Lightweight gypsum building plaster	●●●	●●●
	Lightweight gypsum – lime building plaster	●●●	●●●
Gypsum fire protection plaster	●●●	●●●	●●●

Specialty Additives

Products	ELOTEX®	ELOSET542	SEAL712
Technical Information	Functionality	Thickener	Hydrophobic
	VOC Eimcode Class	-	-
Applications	Gypsum based building plaster, hand applied	●●●	-
	Gypsum based building plaster, machine applied	●●●	-
	Gypsum – lime building plaster, hand applied	●●●	●●
	Gypsum – lime building plaster, machine applied	●●●	●●
	Lightweight gypsum building plaster	●●●	-
	Lightweight gypsum – lime building plaster	●●●	●●
Gypsum fire protection plaster	●●●	-	-

Cellulose Ethers

Products	BERMOCOLL®	CCA 425	CCA 612	CCM 1079
Technical Information	Chemical base	EHEC	EHEC	MEHEC
	Viscosity (2%, mPas)	42'000	36'500	63'000
	Modification	low	strong	strong
	Particle Size	fine powder	extra fine powder	fine powder
Applications	Gypsum based building plaster, hand applied	-	-	●●●
	Gypsum based building plaster, machine applied	●●●	●●●	-
	Gypsum – lime building plaster, hand applied	-	-	●●●
	Gypsum – lime building plaster, machine applied	●●●	●●●	●●●
	Lightweight gypsum building plaster	●●●	●●●	●●●
	Lightweight gypsum – lime building plaster	●●●	●●●	●●●
Gypsum fire protection plaster	●●●	●●●	-	

Board jointing compounds



Gypsum board jointing compounds

Gypsum based or calcium carbonate based filling and smoothing materials are used within board divisions, for filling voids. For gypsum board joints, a special paper tape or a fibre mesh is often placed in the jointing compound mortar as reinforcement between the boards. Commonly used drymix mortars are either fast setting (gypsum based) or slow setting (calcium carbonate based with a high polymer powder binder content). Furthermore, slow setting products are also available in the form of ready-to-use pastes, based on calcium carbonate with a high liquid polymer binder content.

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Products	ELOTEX®	AD0110	AD0150	FL1210	MP2100
Technical Information	Chemical base	VA	VA	VA/E	VA/E
	MFFT (°C)	5	5	3	3
	VOC Emission Class	EC1	EC1 ^{PLUS}	EC1	EC1 ^{PLUS}
Applications	Gypsum based jointing / smoothing compound	●●●	●●●	●●	●●
	Carbonate filler based jointing / smoothing compound	●●	●●	●●●	●●
	Pasty carbonate based jointing / smoothing compound	-	-	●	●

Specialty Additives

Product	ELOTEX®	ELOSET542	SEAL712
Technical Information	Functionality	Thickener	Hydrophobic
Applications	Gypsum based jointing / smoothing compound	●●	●●
	Carbonate filler based jointing / smoothing compound	●●	●●
	Pasty carbonate based jointing / smoothing compound	-	-

Cellulose Ethers

Products	BERMOCOLL®	BCM 108	CCA 328	CCA 470	E 481 FQ	EBM 5500
Technical Information	Chemical base	MEHEC	EHEC	EHEC	EHEC	MEHEC
	Viscosity (2%, mPas)	9'500	33'500	17'000	30'000	33'000
	Modification	strong	strong	strong	no	no
	Particle Size	fine powder	fine powder	fine powder	fine powder	fine powder
Applications	Gypsum based jointing / smoothing compound	●●●	●●●	●●●	-	-
	Carbonate filler based jointing / smoothing compound	●●●	●●●	●●●	-	-
	Pasty carbonate based jointing / smoothing compound	-	-	-	●●●	●●●

Adhesive mortars



Gypsum based adhesive mortars

Gypsum adhesive mortars are mainly used to bond gypsum blocks together or to bond gypsum wallboards or fibre boards to solid walls, made from concrete or bricks. In some locations, gypsum based ceramic tile adhesives are also available on the market.

Redispersible Polymer Powders

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Products	ELOTEX®	AD0110	AD0150	MP2100
Technical Information	Chemical base	VA	VA	VA/E
	MFFT (°C)	5	5	3
	VOC Emission Class	EC1	EC1 ^{PLUS}	EC1 ^{PLUS}
Applications	Gypsum thin-bed adhesive	●●●	●●●	●●●
	Gypsum block adhesive	●●●	●●●	●●●
	Plasterboard adhesive	●●●	●●●	●●●

Specialty Additives

Products	ELOTEX®	ELOSET542	SEAL712
Technical Information	Functionality	Thickener	Hydrophobicity
Applications	Gypsum thin-bed adhesive	●●	●●
	Gypsum block adhesive	●●	●●
	Plasterboard adhesive	●●	●●

Cellulose Ethers

Products	BERMOCOLL®	CCA 328	CCM 1079
Technical Information	Chemical base	EHEC	MEHEC
	Viscosity (2%, mPas)	33'500	63'000
	Modification	strong	strong
	Particle Size	fine powder	fine powder
Applications	Gypsum thin-bed adhesive	●●●	●●●
	Gypsum block adhesive	●●●	●●●
	Plasterboard adhesive	●●●	●●●

Flooring



Gypsum based floor screeds and leveling compounds

Thick layer, flowable anhydrite screeds are used in certain regions, for example in Central Europe for indoor floorings to ensure the appropriate floor evenness before installation of the final top-level floor. Today, a floor heating system is often incorporated. The anhydrite screeds and leveling compounds are usually factory made and delivered as dry powder or wet products to the building site.

Floor leveling compounds are usually used over gypsum based floor screeds in case of renovation.



Redispersible Polymer Powders

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Products	ELOTEX®	FL2211	FL2280	FL3210
Technical Information	Chemical base	VA/E	VA/E	VA/W/E
	MFFT (°C)	3	3	5
	VOC Emission Class	EC1 ^{PLUS}	EC1 ^{PLUS}	EC1 ^{PLUS}
Applications	Gypsum based floor leveling compound	●●	●●	●●●
	Pumpable gypsum screeds	-	-	-

Specialty Additives

Products	ELOTEX®	CAST710	FLOWKIT74	SEAL712
Technical Information	Functionality	Rheology Enhancer	Plasticizing Polymer	Hydrophobic
	VOC Emission Class	EC1 ^{PLUS}	EC1 ^{PLUS}	-
Applications	Gypsum based floor leveling compound	●●	●	●●●
	Pumpable gypsum screeds	●●●	●	●

Cellulose Ethers

Product	BERMOCOLL®	E 230 X
Technical Information	Chemical base	EHEC
	Viscosity (2%, mPas)	300
	Modification	no
	Particle Size	extra fine powder
Applications	Gypsum based floor leveling compound	●●●
	Pumpable gypsum screeds	●●●

Additional applications

Performance Additives



Gypsum wallboards or fibre boards

These boards are commonly used in private houses and public buildings for indoor walls, ceilings and floors. Their main advantage is their quick dry installation which makes them very economical. They also offer excellent thermal and acoustic insulation, as well very good fire-resistance. These boards are produced on a large scale in specialised factories.



Massive gypsum wall blocks, ceiling tiles and decorative ornaments

These solid blocks and tiles are often used in private houses and public buildings for indoor walls and ceilings. Their main advantage is their excellent thermal and acoustic insulation. They also have very good fire resistance. These blocks and tiles are factory produced.

Gypsum plaster for casting moulds

Special natural gypsum plasters are used for moulds in the ceramic and pottery industry. This special gypsum provides high strength, high porosity for water absorption and high durability.



Performance additives for gypsum building materials

Depending on the intended final use of the gypsum, its final properties can be influenced by the selection of the rock itself, by its burning temperature, ground particle size, or by the use of appropriate performance additives. The use of performance additives will influence:

- viscosity of gypsum
- water retention of gypsum
- adhesion and cohesion force
- density, by influencing air entraining or defoaming

In addition to performance additives for gypsum, to influence the setting of gypsum, chemical additives can also be used. These chemical additives are generally classified as:

- setting accelerators or
- setting retarders

Furthermore, to impart special properties to gypsum products, the following additives can be used:

- anti-fungal additives
- anti-corrosion additives
- pigments
- hydrophobic additives

BERMOCOLL® Cellulose Ethers

More than 50 years of production and development experience enable us to offer an optimised portfolio of BERMOCOLL® Cellulose Ethers to the gypsum drymix mortars industry. BERMOCOLL® Cellulose Ethers have been developed to impart a range of properties in drymix mortars. Depending on the end-user requirements, BERMOCOLL® products provide:

- viscosity and mortar consistency, even at different temperatures
- water retention for excellent workability and proper curing
- improved adhesion to different substrates and surface materials

The main BERMOCOLL® product lines specifically suitable for gypsum building products are:

- BERMOCOLL® **CCA** grades based on EHEC technology, offering the best balance between water retention and workability. The CCA grades are modified to prevent slip/sagging on vertical surfaces and to prevent lump formation in the wet mixing stage.
- BERMOCOLL® **CCM** grades are based on MEHEC technology, have the highest viscosity and provide the best water retention. All CCM grades are modified to fit selected applications such as hand, machine or mounting plasters.

- BERMOCOLL® **BCM** grades are based on MEHEC technology and differ from the CCM range with regard to the degree of substitution. These products have been developed and are recommended for use in gypsum based jointing compounds.
- BERMOCOLL® **EBM** grades are based on MEHEC technology and are recommended for use in pasty, ready-to-use products such as latex-based jointing compound. EBM grades are not influenced by other raw materials in the pasty product and ensure stable shelf life.

ELOTEX® Redispersible Polymer Powders

ELOTEX® Redispersible Polymer Powders have a decisive influence on gypsum based finished drymix mortar products. Our free-flowing redispersible polymer powders are obtained through spray-drying of optimised latex dispersions. Expertise in the development and production of special latex dispersions allows AkzoNobel to supply an unprecedented range of products, bringing defined improvements to a wide range of gypsum based mortars:

- viscosity and consistency improvement
- adhesion improvement
- reduced rigidity, improved flexibility
- increased surface abrasion resistance
- improved durability
- improved levelling and de-foaming

The main ELOTEX® product lines specifically suitable for gypsum building products are:


- ELOTEX® **AD** vinyl acetate homo-polymers providing very high dry adhesion strength
- ELOTEX® **MP** multi-purpose co-polymer products based mainly on vinyl acetate / ethylene
- ELOTEX® **FL** co-polymer products providing excellent levelling and de-foaming properties to self-levelling flooring compounds

ELOTEX® Specialty Additives

The ELOTEX® Specialty Additives range comprises a number of different technologies ranging from formulated additives such as our ELOTEX® CAST family, over ELOSET starch ethers to encapsulated silane technology used in the development of our ELOTEX® SEAL products. ELOTEX® Specialty Additives improve the raw and final properties of construction mortars based on gypsum.

Key

●●● = excellent ●● = very good ● = good

 = eco-friendly product

Abbreviations

VA = Vinyl acetate, VV = Vinyl versatate, E = Ethylene



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AkzoNobel creates everyday essentials to make people's lives more liveable and inspiring. As a leading global paints and coatings company and a major producer of specialty chemicals, we supply essential ingredients, essential protection and essential color to industries and consumers worldwide. Backed by a pioneering heritage, our innovative products and sustainable technologies are designed to meet the growing demands of our fast-changing planet, while making life easier. Headquartered in Amsterdam, the Netherlands, we have approximately 46,000 people in around 80 countries, while our portfolio includes well-known brands such as Bermocoll, Elotex, Sikkens, International, Interpon and Eka. Consistently ranked as a leader in sustainability, we are dedicated to energizing cities and communities while creating a protected, colorful world where life is improved by what we do.

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