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 (CaSO$_4$ • 2 H$_2$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 (α-CaSO$_4$ • ½ H$_2$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 (β-CaSO$_4$ • ½ H$_2$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 (α-CaSO$_4$) from autoclave production and β-Anhydrite III (β-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 gypsiums, 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.
Main gypsum based building materials in construction

Plasters

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.

AkzoNobel is the biggest paints and coatings company in the world and a leading producer of specialty chemicals. Our Performance Additives business unit (part of our Functional Chemicals business) is made up of two reliable world class brands in the building and construction industry. BERMOCOLL® and ELOTEX® are world leaders in their field: making performance enhancing additives and solutions for the dry and ready-mixed mortar industry. We have more than 50 years of experience in powder technology. This allows us to develop special products for you in order to provide you with Tomorrow’s Answers Today.

BERMOCOLL® is very keen on the EHEC and MEHEC technology which is widely used in paints and construction building materials. BERMOCOLL® products are based on cellulose, which is a natural polymer found in wood pulp and cotton linters. We use a process known as etherification to change the water insoluble cellulose into the water soluble ethers ethyl hydroxyethyl cellulose and methyl ethyl hydroxyethyl cellulose. These cellulose ethers are not only used in the paint industry, they are also very important for the dry and ready mix mortar industry to:

• Increase water retention
• Make thin layer products workable
• Provide suitable consistency
• Prevent separation
• Improve adhesion on porous surfaces

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.
### Board jointing compounds

Gypsum board jointing compounds 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 dry mix mortars are either fast setting (gypsum based) or slow setting (calcium carbonate based with a high polymer 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.

### Adhesive mortars

Gypsum based 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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<tr>
<th>Products</th>
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<th>AD0110</th>
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### Specialty Additives

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Gypsum based floor screeds and leveling compounds

Thick layer, flowable anhydrite screeds are used in certain regions, for example in Central Europe for indoor flooring 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.

Flooring
Additional applications

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

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 dry mix mortars industry. BERMOCOLL® Cellulose Ethers have been developed to impart a range of properties in dry mix 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 dry mix 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

Abbreviations

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