ELEMENTIS

BENAQUA® 6000

Multifunctional additive boosting
open time and workability

Cementitious Tile Adhesives Challenge

While the global construction industry navigates a complex landscape of cost pressures and regional market adjustments, specific product trends and installer demands continue to evolve decisively.

Growing Preference for Large Format Tiles

The large format tile segment accounted for over 35% of total adhesive sales in 2024, with projections indicating this could grow to 45% by 2032. The widespread adoption of large-format tiles and ultra-thin porcelain slabs is driving demand for adhesives with extended open time for adjustment, excellent sag resistance for vertical installation, and superior workability for proper bedding—performance attributes that standard formulations struggle to deliver.

Sustainability Imperatives Reshaping Formulation Strategies

The global green building materials market is projected to grow at 11% annually through 2032. Alongside tightening VOC regulations and raw material volatility, this shift is pushing manufacturers to simplify formulations, reduce dependency on costly polymers, and adopt natural, efficient technologies—without compromising performance.

In this environment, manufacturers need a new approach to tile adhesive formulations that not only boost performance but also streamline formulation design and strengthen their competitive position. A multifunctional solution that replaces several raw materials, ensures consistent rheology across regions and standards, and helps create adhesives that are easier to apply, more efficient to produce, and aligned with sustainability goals.

Scientific Principle / Background

The Science of Tiles Placement

One of the main challenges when installing tiles with a cementitious adhesive is ensuring proper adhesion and durability while having enough time for precise tile placement. Controlling the mixing ratio and ensuring uniform application is key, as incorrect consistency can lead to voids, poor adhesion, or cracking. The adhesive's open time is critical, which necessitates quick and precise work to prevent it from losing its properties before tile placement.

Finally, factors such as ambient temperature and substrate absorption influence the setting time, requiring experience and attention to detail to achieve a secure and durable finish. By adopting BENAQUA® 6000 rheology modifier, formulators can benefit from improved workability due to the change in consistency of the tile adhesive to a "buttery feel" during application, and on other side, can also achieve a smooth finish and the necessary sag resistance (anti-slip performance) for an extended open time (30 min) in compliance with ISO 13007-1:2014.

BENAQUA® 6000

Multifunctional additive designed to meet modern tile installation standards, it simplifies formulation design while maintaining or improving adhesion strength. BENAQUA® 6000 supports leaner operations, allows flexibility in raw materials helping to maintain consistent performance and possible cost advantages, meeting the needs of both manufacturers and professional installers.

Key Benefits

- **Extended open time**: Achieves >30 minutes, giving installers more flexibility when placing large-format tiles.
- **High adhesion strength**: Maintains >1.0 N/mm², achieving C2 classification.
- **Excellent sag control**: Meets ISO 13007 slip resistance requirements (<0.5 mm sag) for vertical applications.
- **100% active and natural-based powder**: Derived from hectorite clay, >97% active content – a clean, sustainable choice.
- **Superior workability**: Provides a smooth, “buttery” consistency that improves troweling, tile placement, and alignment during installation.
- **Formulation cost savings**: Allows more flexibility for the formulator to choose a more effective combination of raw materials, helping to maintain consistent performance.

Proven Performance. Simplified Formulation.

Delivering high-performance tile adhesives goes beyond selecting the right drymix materials; it requires customized additive selection depending on the cementitious main ingredients and target performance.
As a first key performance point, we target to accomplish normative EN 12004/ISO13007, to achieve C2TE requirements by using a very simple and low-cost cementitious tile adhesive formulation.

Table 1: Basic CTA formulation. Water demand 20%w/w at room temperature.

Raw Material	Weight (%)	EN 12004/ISO 13007
Portland Cement (42.5R)	33	**C2** = Improved cementitious adhesive, with a minimum tensile adhesion of 1.0 N/mm^2 under dry, wet, heat, and freeze-thaw conditions. **T** = Reduced slip (≤ 0.5 mm vertical slippage), ideal for vertical applications. **E** = Extended open time, with ≥ 30 min open time where ≥ 0.5N/mm^2 adhesion is retained
Filler- Sand (150um-300um)	61,9	
Accelerator*	0.1	
Redispersable polymer	4	
Rheological additives**	1	

*Addition of the accelerator is only for use when fast setting properties are required for early foot traffic.
** Rheological additives: (1% BENAQUA® 6000) vs (0.4% cellulose + 0.6 % inorganic fillers).

The data presented in the table indicates a clear advantage in C2TE formulation by using our BENAQUA® 6000 as a unique and single rheological additive, making possible a low cost and simple formulation.

Table 2: results of our basic CTA formulation adhering to the normative EN 12004/ISO13007

Open time 20 mins tensile strength 28 days (N/mm^2)	1.27
Open time 30 mins tensile strength 28 days (N/mm^2)	0.98
Tensile strength (N/mm^2) @ 7 days	2.12/CF-A
Tensile strength (N/mm^2) @ 28 days	1.97/CF-A
Slip (mm)	0.15

*Lab tests run at 23ºC room temperature

Comparing performance of 2 commercially available market reference C2TE cementitious tile adhesives versus the same market reference formulations substituting cellulose with our BENAQUA® 6000 and versus our basic CTA formulation. The table below shows better results by adding our BENAQUA® 6000 in all cases.

Table 3: Comparation with market references

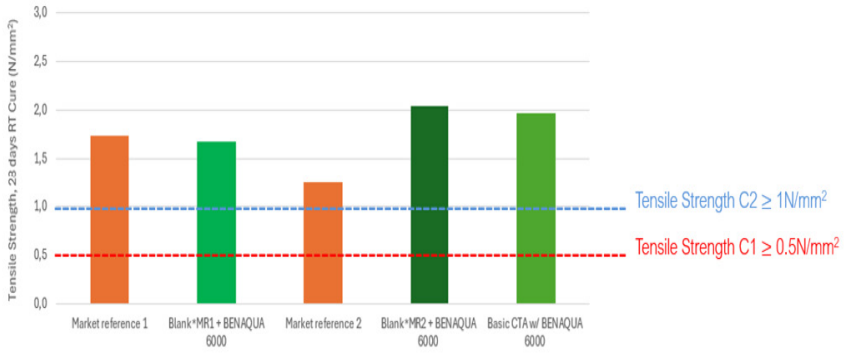
	Market Reference #1	Blank* Market Ref. #1 w/BENAQUA® 6000	Market Reference #2	Blank* Market Ref. #2 w/BENAQUA® 6000	Basic CTA w/ BENAQUA® 6000
Open time 20mins (Results 28 day (N/mm^2))	0.98	1.25	0.61	1.11	1.27
Open time 30mins (Results 28 day (N/mm^2))	0.73	0.98	0.32	0.94	0.98
Tensile strength @23ºC (Results 28 day (N/mm^2))	1.74	1.68	1.25	2.05	1.97
SLIP (mm) in real conditions test**	Reduction of 40% slip		Reduction of 10% slip		0.15

Market Reference= ready-to-use commercial CTAs with Cellulose in
Blank* Market= ready-to-use commercial CTAs without Cellulose
Tests completed with 20%w/w water demand at room temperature. Additional tests with water demand between 20% and 28% have been successfully completed.
**Real life condition test : Test completed with a 300mmx300mm fully vitrified tile on a gypsum backer board. All tests carried out at standard room temperature of 23ºC

Demonstrating excellent tensile strength fulfilling the criteria of both C1 and C2 adhesives, with no compromise on adhesion strength 28 days RT Cure.

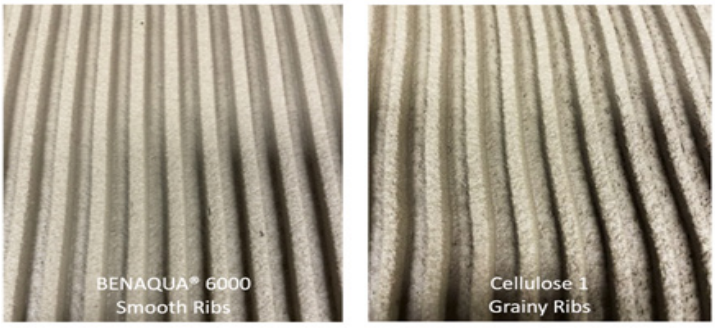
It is demonstrated that our unique multifunctional additive BENAQUA® 6000 can improve performance for existing market reference C2TE tile adhesive formulations in essential aspects to improve tile installation:

Graphic 1: performance comparation in commercial CTAs



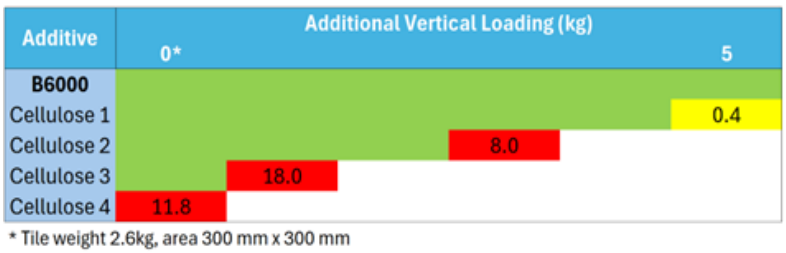
- BENAQUA® 6000 delivers **great tensile adhesion strength** (over 1.0 N/mm²) at extended open time (above 30mins); a key aspect for tile

Picture 1: Basic CTA formulation applied in ribs.



- **Better workability** by enabling smooth mixing, better application, and ease of troweling.

Graphic 2: slip resistance in vertical application with increased tile weight



- Imparts **excellent slip resistance** in vertical wall applications, even at increased tile weight.

All above studies had been realized comparing CTA basic formulation with BENAQUA® 6000 at 1% vs CTA basic formulation with Cellulose at 0.4% + 0.6% inorganic fillers.

Environmental & Regulatory Advantages

Our BENAQUA® 6000 has been designed to help formulators meet Performance Regulations in EMEIA (EN12004/ISO13007) and America (ANSI A118/A118.15). Being a 100% natural product with an inorganic base, this enhances the sustainable profile for cement based blends. It has been proved that the excellent rheological performance and structure-building ability of natural hectorite-based additives help to reduce usage of non-natural chemicals, contributing to a more environmentally friendly profile for dry mix systems.

Compatibility and Long-term Performance

Our BENAQUA® 6000 is a 100% natural additive broadly compatible with all kinds of dry mix formulations as it is based on inorganic raw materials. Ideal for powder adhesives and dry mortar such as tile adhesives, stucco and cement-based plasters for industrial and construction applications.

Chemical & Physical Properties

- Composition : Modified hectorite clay
- Appearance: Off white finely divided powder
- Non-volatile content > 97%
- Natural content : 100%
- Density: 0.65 g/cm^3
- Recommended level of use: 0.5-1.5%
- Compatibility: highly compatible with all kinds of dry mix raw materials and additives
- Storage conditions: keep in cool and dry locations

Applications

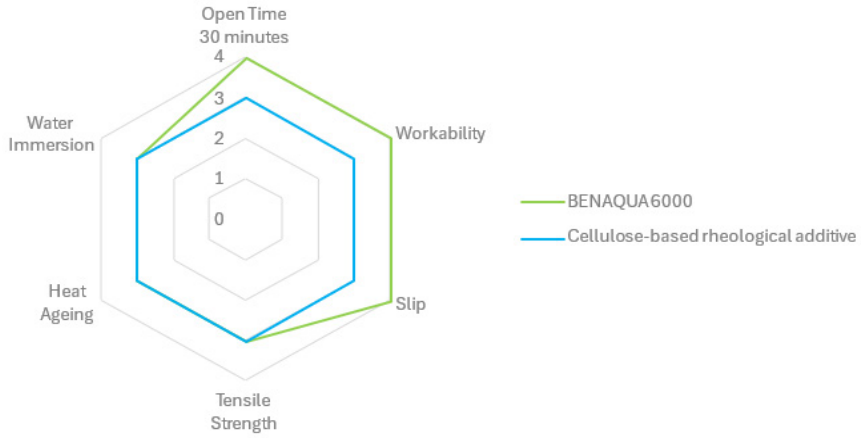
- Cementitious systems
- Dry Mortars
    - Tile Adhesives
    - Stucco
    - Pool Plasters (cement based)
    - Skim coats

Be Natural. Be Simple. Be Efficient.

BENAQUA® 6000 introduces a new generation of multifunctional powder rheology technology. Designed to replace multiple cellulose types and other rheological additives, it enables formulators to achieve over 30 minutes of open time, excellent sag resistance, and a highly workable, “buttery” consistency with a single, natural-based ingredient.

BENAQUA® 6000 allows for more simple formulation design, more predictable quality, and cost-effective performance. Meanwhile, it supports leaner operations meeting the needs of both manufacturers and professional installers.

Graphic 3: Comparation on Cementitious Tile adhesives



3 level – Pass the target criteria to achieve C2TE classification.

Result based on comparation of CTA basic formulation with 1% BENAQUA® 6000 vs CTA basic formulation with 0.4% cellulose loadings + 0.6% inorganic fillers.

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