

# Clay Geosynthetic Barriers

for Environment and Building protection



**Modulo Geobent<sup>®</sup>**  
**Edilmodulo<sup>®</sup>**



**LAVIOSA**  
*Advanced Mineral Solutions*

[www.laviosa.com](http://www.laviosa.com)



# About bentonite

Bentonite is a clay mineral of the smectite group and is composed mainly of montmorillonite. The smectites are a group of minerals that swell as they absorb water or organic molecules within the structural layers; they also have considerable cationic exchange properties.

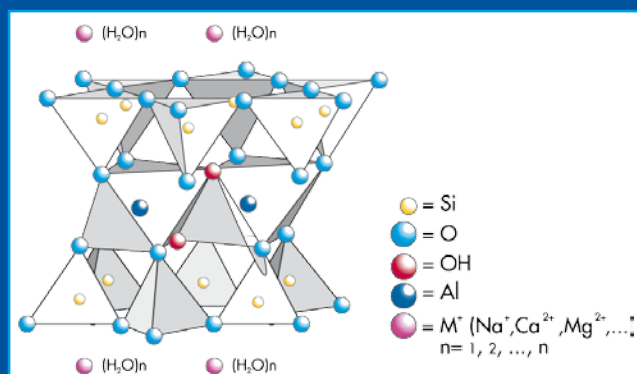
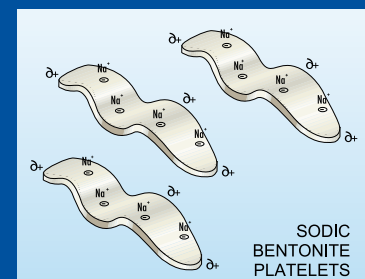
The clay mineral they are composed of in the crystalline state is derived from the devitrification, and consequent chemical change, of glass of magmatic origin, usually tufa or volcanic ash (definition by Ross and Shannon, 1926).

The nature and volcanic origins of bentonite deposits give rise to varieties of the mineral that are often extremely heterogeneous. The bentonites can be described as sodium, calcium and acid bentonites.

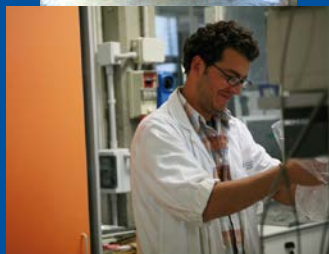


The crystallographic basis of the montmorillonite (bentonite) is typical of phyllosilicates: sheets of AlX octahedrons (X=oxygen or oxydril) between two sheets of SiO<sub>4</sub> tetrahedrons. In the octahedron layer the aluminium may be replaced by magnesium, thus giving rise to an excess negative charge: the negative charge in excess is compensated by various mono and bivalent cations (Ca<sup>++</sup>, Mg<sup>+</sup>, Na<sup>+</sup>...). This elementary particle is a lamella: the various lamellas are held together in "packets" by Van der Waals force, but they can be "delamellised" and dispersed in water in sub-micronic particles until a specific superficial area of 800 m<sup>2</sup>/g is developed.

A reliable barrier system is realized with the use of **natural sodium bentonite**, which has a high grade for swelling (higher than 24 ml/2g) and water absorption (fixed as liquid limit value higher than 500%), and gives rise to a gelling with excellent waterproofing properties.



# The Company



Laviosa Chimica Mineraria is one of the major global suppliers of bentonite products: process and distribution of special clays is our core business. We have developed numerous possible applications for these minerals as prime material for industry or mass market end products.

Our products, together with applicative consultancy of our technicians e our services, are sold in more than 80 countries in the world to more than 1.500 customers, engaged in several different fields of application. Our special clays are used, other than in the landfill application, in coatings and detergency formulations, in paper production processes, in civil engineering, in casting and others: in all these our products contribute to find solutions of **high added value**. The company's strength lies in people constant attention to **innovation, growth and value creating**.

Quality of our process is certified by the international standard ISO 9001:2008



## Lining & Waterproofing Technologies Division

Environmental Engineering covers work regarding the techniques involved in soil waterproofing and lining, hydraulic works, structures below the plane of site and applications related to transportation. All sectors of activity are being developed and their characteristics are those of international markets.

All sales related to the mentioned fields of applications are characterized by high technical content, which require constant support to designers, installers, contractors and government offices.

The offer includes:

- **Modulo Geobent®** and **Edilmodulo®**, a range of needle-punched **Geosynthetic Clay Barriers**, based on natural sodium bentonite;
- **Laviobent® GR** and **Laviobent® P**, a range of **Sodium and Calcium bentonites** in granules or in powder form, to be mixed with soils in order to create low permeability mixtures, or with waste in waste pre-treatment processes.
- **Bentonite Waterstop (Lavioseal®)** and **accessories** for building waterproofing.





# Environmental applications

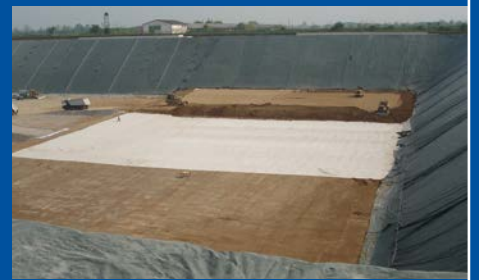
**Clay Geosynthetic Barriers (GBR-C)** are hydraulic barriers, “constructed components” that are a fundamental part of a waterproofing barrier system. They consist of a **layer of bentonite**, or other materials with extremely low water permeability, supported by **geotextiles and/or geomembranes**, and are **mechanically assembled** by reinforcing or by chemical adhesives

Main applications	Notes
Geosynthetic Clay Barriers are hydraulic barriers, “constructed components” that are a fundamental part of a barrier system for <b>solid and liquid waste disposal</b> .	Combined with an HDPE geomembrane, the GBR-C does not require further covering.
Waterproofing of <b>temporary storage of solid and liquid waste</b> .	The GBR-C can provide a single barrier system. Before the final layer of asphalt is applied, it must be protected by covering with soil and, if necessary, with geosynthetic reinforcement.
Capping of <b>solid waste disposal containers</b> at the end of their working life.	The GBR-C can be used as a single waterproofing barrier. The barrier system must be completed with other special geosynthetics if required because of the geotechnical characteristics of the intervention. The area must be adequately covered over with mixed soil.
Waterproofing of areas where <b>roads</b> pass in environmental <b>conditions of particular interest</b> .	Completed with a covering of mixed soil, the GBR-C solves the problem of waterproofing.
Waterproofing of areas where there are <b>hydrocarbon deposits and derivatives</b> (refineries, oil pipelines, service stations, transformers in power stations, etc.)	The GBR-C is laid and then covered with soil and a layer of concrete.
Waterproofing of <b>basins, tanks for fish farms, ornamental lakes, reservoirs</b> .	The container is treated with the GBR-C and an appropriate covering of granulometer-controlled soil completes the barrier system.
Lining of Heap Leaching Pads in <b>mining activities</b>	Geosynthetic Clay Liners are used in combination with HDPE membrane in is the composite lining system with an overlying drain cover fill having the primary purpose of the composite pad liner design is to prevent the loss of pad and pond process solutions from the lined facilities.

## MODULO GEOBENT® XP

Modulo Geobent® XP is a reinforced Clay Geosynthetic Barrier made of one **non-woven polypropylene geotextile** as cover layer, and a one **woven polypropylene geotextile** as carrier layer, which encapsulate a uniform layer of natural sodium bentonite.

The connection between the cover and carrier geotextile is achieved by a **specific reinforcement system** which enable the two geotextiles to be joined by thousands of fibers through the bentonite layer. This kind of reinforcement is especially made in order to cut down internal shear forces acting on the barrier, making Modulo Geobent XP a perfect solution for application on **steep slopes**, and giving the barrier a pre-confinement which **increase the barrier capability** to remain exposed before the finale confinement is reached. The dimension of the particles of the bentonite together with the open size of the non-woven geotextile are carefully calibrated in order to achieve a **full saturation of the geotextiles**, once the barrier is fully hydrated, increasing the self-seaming of the rolls on the overlapping area.



# Building applications

The entire waterproofing barrier system is composed of the Clay Geosynthetic Barrier and provides constant protection for underground structures during their short or long – term working life. Depending on the application, confinement is provided by concrete, spritz-beton, prefabricated structures or backfill. Waterstop made of bentonite are available for the waterproofing of casting joints.

## Main Waterproofing Applications:

- vertical and horizontal foundations and underground structures
- tunnels (with particular attention to problems with inverted arches)
- underground tunnels
- flood protection of **concrete or masonry constructions**: the GBR-C is placed in direct contact with the construction and protected by an adequate covering of concrete or earth.

## EDILMODULO® XP

Edilmodulo® XP is a needle-punched Geosynthetic Clay Barrier made of one non-woven polypropylene geotextile as cover layer, and a one woven polypropylene geotextile as carrier layer, which encapsulate a uniform layer of natural sodium bentonite.

Edilmodulo® XP has a high resistance to mechanical stresses and numerous applications in waterproofing where the requirement is for low hydraulic conductivity, stability over time, durability, ease of installing, self-seaming in overlapping, and self-healing

The connection between the cover and carrier geotextile is achieved by a specific reinforcement system which enable the two geotextiles to be joined by thousands of fibres through the bentonite layer.

The dimension of the particles of the bentonite together with the open size of the non-woven geotextile are carefully calibrated in order to achieve a full saturation of the geotextiles, once the barrier is fully hydrated, increasing the self-seaming of the rolls on the overlapping area.

This special solution ensures both the complete adhesion of the bentonite to the two geotextiles, and the homogeneous swelling of the natural sodium bentonite, even in contact with waters of low salinity content.



## LAVIOSEAL®

Lavioseal® is a swelling bentonite waterstop used for sealing cold joints in concrete structures, both in vertical and horizontal application. The waterstop is manufactured with a particular type of sodium bentonite, pre-treated with polymers and additives, that makes a product extremely performing.

# Certificates







**Laviosa Trimex  
Industries Pvt Ltd**

No 107/108, Neelkanth  
Commercial Centre, Plot No  
122/123, Sahar Road, Andheri  
East, Mumbai – 400099 - INDIA

**LAVIOSA SANAYI  
VE TICARET LTD.  
STI.**

Konakbasi MH. Fatsa Organize  
Sanayi Bolgesi  
52400 Fatsa-Ordu, TURKIYE

**Laviosa mpc sas**

Zone portuaire - 62 route du Hazay  
78520 Limay FRANCE

**Laviosa Chimica  
Mineraria S.p.A**

via Leonardo da Vinci, 21  
I-57123 Livorno - ITALIA



**LAVIOSA**  
*Advanced Mineral Solutions*

[www.laviosa.com](http://www.laviosa.com)  
[lwt@laviosa.com](mailto:lwt@laviosa.com)