

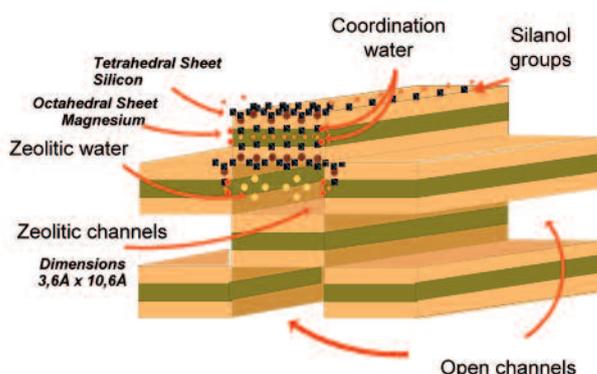
Sepiolite

What is Sepiolite?

Sepiolite, formerly known as Meerschaum (sea froth), is a non-swelling, lightweight, porous clay with a large specific surface area. Unlike other clays, the individual particles of sepiolite have a needle-like morphology. The high surface area and porosity, as well as the unusual particle shape of this clay account for its outstanding sorption capacity and colloidal properties that make it a valuable material for a wide range of applications.

Sepiolite is a very uncommon clay because of both its peculiar characteristics and scarce occurrence. There are very few commercial deposits in the world. Most of the world production of this clay comes from deposits of sedimentary origin located near Madrid, Spain.

Chemically, sepiolite is a hydrated magnesium silicate with the ideal formula $\text{Si}_{12}\text{Mg}_8\text{O}_{30}(\text{OH})_4(\text{OH}_2)_4 \cdot 8\text{H}_2\text{O}$. Sepiolite, unlike other clays, is not a layered phyllosilicate. Its structure can be described as a quincunx (an arrangement of five objects, so placed that four occupy the corners and the fifth the centre of a square or rectangle) of talc-type sheets separated by parallel channels. This chain-like structure produces needle-like particles instead of plate-like particles like other clays.



Sepiolite has the highest surface area (BET, N_2) of all the clay minerals, about $300 \text{ m}^2/\text{g}$, with a high density of silanol groups ($-\text{SiOH}$) which explains the marked hydrophilicity of this clay. The silicate lattice has not a significant negative charge and therefore the cation exchange capacity of this clay is very low.

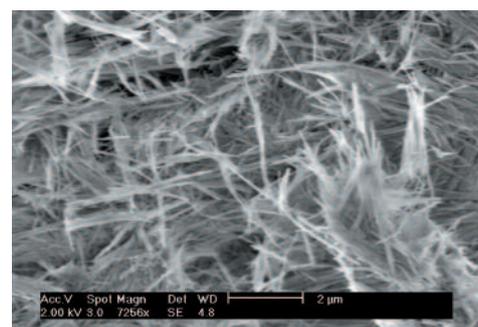
The tiny elongated particles of sepiolite have an average length of $1 \mu\text{m}$ to $2 \mu\text{m}$, a width of $0.01 \mu\text{m}$; and contain open channels with dimensions of $3.6 \text{ \AA} \times 10.6 \text{ \AA}$ running along the axis of the particle.

These particles are arranged forming loosely packed and porous aggregates with an extensive capillary network which explains the high porosity of sepiolite and its light weight because of the large void space.



The high surface area and porosity of sepiolite account for the remarkable adsorptive and absorptive properties of this clay. It adsorbs vapours and odours and can absorb approximately its own weight of water and other liquids.

Sepiolite is a non-swelling clay and its granules do not desintegrate even when saturated with liquids. Colloidal grades of sepiolite must be dispersed into water or other liquid systems using high-shear mixers. Once dispersed in the liquid, it forms a structure of randomly intermeshed elongated particles, which is maintained by physical interference and hydrogen bonding, and entraps the liquid, increasing the viscosity of the suspension. This structure is stable even in systems with high salt concentrations, conditions that produce the flocculation of other clay's suspensions, as bentonite.



The random network of sepiolite particles holds coarser particles in the liquid preventing their settling by gravity, acting as a suspending agent. Sepiolite provides to its suspensions a pseudoplastic and thixotropic behaviour which make it a valuable material in multiple applications to improve processability, application or handling of the final product.

Industrial Minerals

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A special clay with endless uses

The outstanding sorptive and colloidal properties of sepiolite provide specific solutions for a wide variety of industrial applications.

- **Cat and Pet litters:** The popularity of sepiolite pet litters is due to its light weight, high liquid absorption and odour control characteristics. Sepiolite absorbs pet urine and has a dehydrating effect on solid faeces which minimises bad odours and inhibits bacteria proliferation.
- **Industrial absorbents:** Sepiolite absorbs liquid spills and leaks keeping work and transit areas dry and safe. Sepiolite is a non-flammable material with high liquid absorbing capacity, suitable mechanical strength of the granules even in wet conditions, and chemical inertness which avoids reaction with absorbed liquids.
- **Waste treatment:** Sepiolite absorbs toxic and hazardous wastes in stabilization or inertisation treatments.
- **Carrier for chemicals:** Sepiolite absorbs active chemicals, as pesticides, remaining free-flowing and allowing an easy use and effective application of the product in the field.
- **Moisture control:** Sepiolite adsorbs excess humidity preventing condensation, corrosion, the proliferation of microorganisms and unpleasant odours.
- **Household Uses:** Sepiolite has numerous domestic applications such as moisture control, containment of accidental liquid spillages, and use in ashtrays to avoid smoke odour, control of liquid leakages and odours in dustbins, odour removal in refrigerators, etc.
- **Animal Feedstuffs:** Sepiolite is registered in the EU as a technological additive for animal feed (E-562). Sepiolite products are used as binders and anti-caking of free-flowing additives as well as excipient of supplements. Sepiolite-based rheological products are also used as suspending additives in liquid feeds for pigs and ruminants.

- **Fertilisers:** Sepiolite improves stability and components suspension of fluid fertilisers in spraying or fertirrigation applications.
- **Polymers and Elastomers:** The use of sepiolite fillers improve processing, dimensional stability, mechanical strength and thermal resistance.
- **Roof Panels:** Sepiolite improves binding of the components while increasing the fire resistance.
- **Construction additives:** Sepiolite provides thixotropy making for easier application, preventing sagging and providing a better quality finish in mortars, plasters and concrete. It is also used as a processing aid in the manufacture of fibre-reinforced cement products.
- **Bitumens:** Sepiolite allows controlling the rheological properties in heat application systems, improving fire resistance. It also improves the stability and the application in emulsions and asphalt in solvent products.
- **Rheological additives for aqueous systems:** Sepiolite provides stability, pseudoplasticity and thixotropy in different applications as paints, adhesives, mastics and sealants.
- **Rheological additives for organic systems:** Organically modified sepiolite allows controlling the rheological behaviour of different solvent-based systems as paints, greases, resins and inks enhancing their stability under a wide temperature range and making for easier application.

For more information, please contact:

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