



CaLoSiL[®] - Stone Consolidation with Nano-Particles

The main issues with building refurbishment are:

- Stabilization, conservation or replacement of damaged artificial or natural stone, plaster or mortar.
- Selection of favorable stone consolidants.
- Test and selection of favorable application technologies.



Destroyed Romanic portal

In all cases refurbishment requires **materials which are compatible with the components originally used** during construction. This is essential for the consolidation of natural stone such as limestone, marble or sandstone as well as for mortar and plaster. The materials and components currently available, however, do not fulfill these demands. Many examples are well known, in which the use of unsuitable materials have caused additional damage. Main problems are: deep penetration of the stone consolidants into damaged structures, long term stability and the application of foreign matter as consolidants such as plastics

Nano-materials offer many advantages for the refurbishment of stones such as:

- Possibility to penetrate deep into damaged zones, no limitations due to the particle size
- High reactivity and fast reactions (such as carbonatisation) in the treated zones
- High purity and defined composition.

The first **commercially available stone consolidant** based on nano-materials is the product **CaLoSiL[®]**. It has been produced since October 2006. **CaLoSiL[®]** contains calcium hydroxide nano particles suspended in different alcohols. Typical concentrations are between 5 and 50 g/L. The particles have sizes ranging between 50 and 150 nm, depending on the production process. Treatment of stones with **CaLoSiL[®]** results in the formation of solid calcium hydroxide after evaporation of the alcohol. That converts into CaCO₃ (calcite) in a way similar to traditional lime mortars by reaction with atmospheric carbon dioxide. The solvent evaporates without any residues. Compounds deteriorating stone or mortar are not formed.



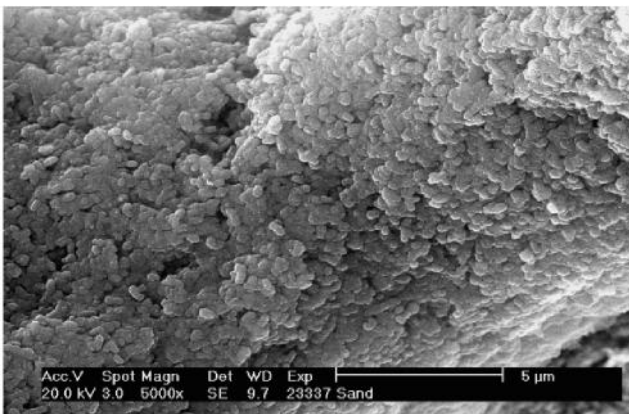
CaLoSiL[®] with different concentrations



Possible application techniques for the treatment of stone or mortar with CaLoSiL[®]

CaLoSiL[®] combines the following **advantages**:

- Consolidation of limestone, marble and related materials by conversion of calcium hydroxide into calcium carbonate.
- Consolidation of mortar, plaster and sandstone in combination with conventional stone strengtheners such as silicic acid esters.
- Stabilization of mortar and plaster as well as wall paintings with the formation of calcium carbonate.
- Neutralization of acidic, sulfate containing zones.



Calcium carbonate formed in porous mortar

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