Nanomortars:
Studies for approaching a hydraulic nanobinder

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Aim of work

To create a nanobinder with hydraulic properties to be employed on surface treatment of historic masonries

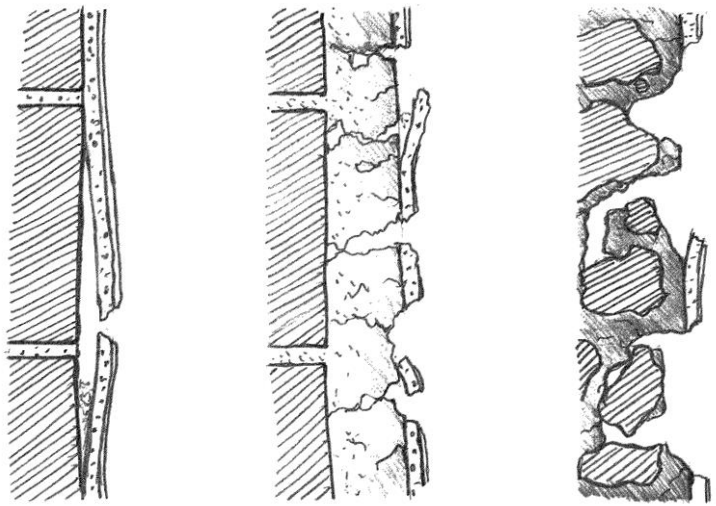
REQUIREMENTS:

- Chemical, physical and mechanical compatibility
- nano-sized dimensions
- consolidating properties
- based on a hydraulic reaction

Degradation of mortars

Causes of degradation:

chemical, physical and/or biological factors



Effects of degradation:

- dissolution of binding components,

- mechanical resistance decrease,

- powdering, loss of cohesion and detachments

Consolidation criteria

- Compatibility

The introduced materials will not cause damage on the original material

- Ripetitivity of the intervention

The consolidating product applied should not interfere with a new treatment

- Reversibility

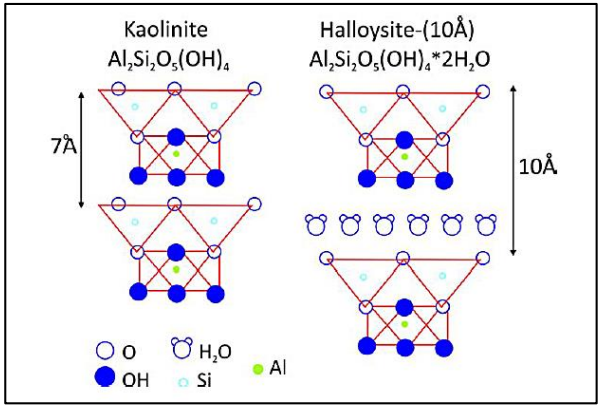
-> Consolidation is irreversible!

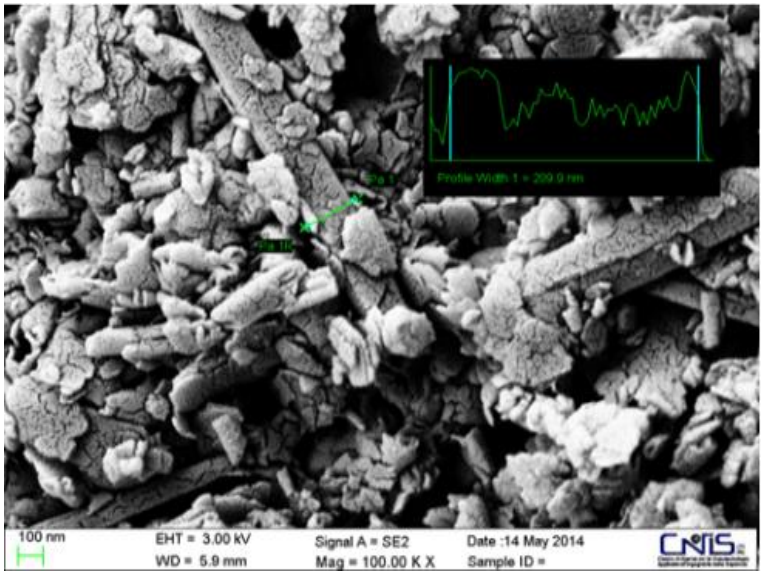
..about bad conservation practices…

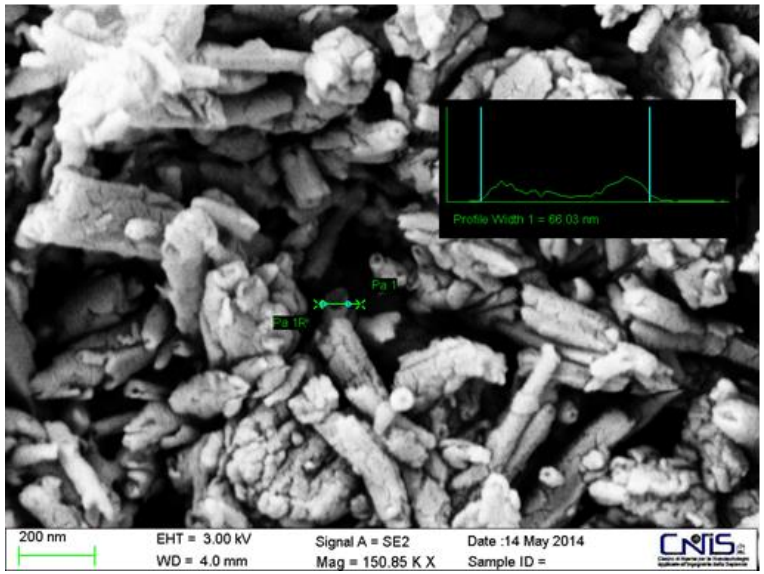
Materials

Binder: nano-lime

Activated aggregates: Halloysite and Kaolin



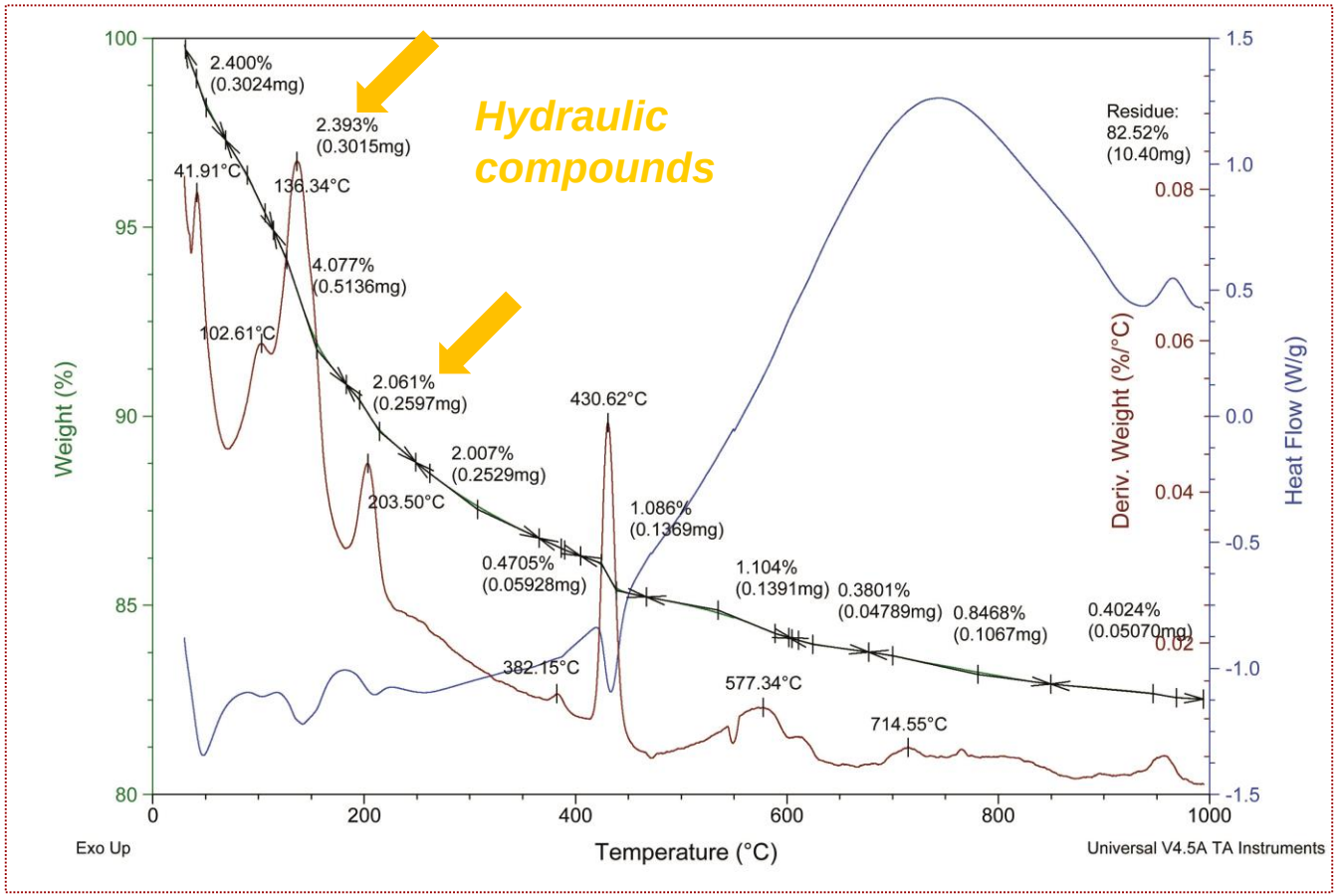




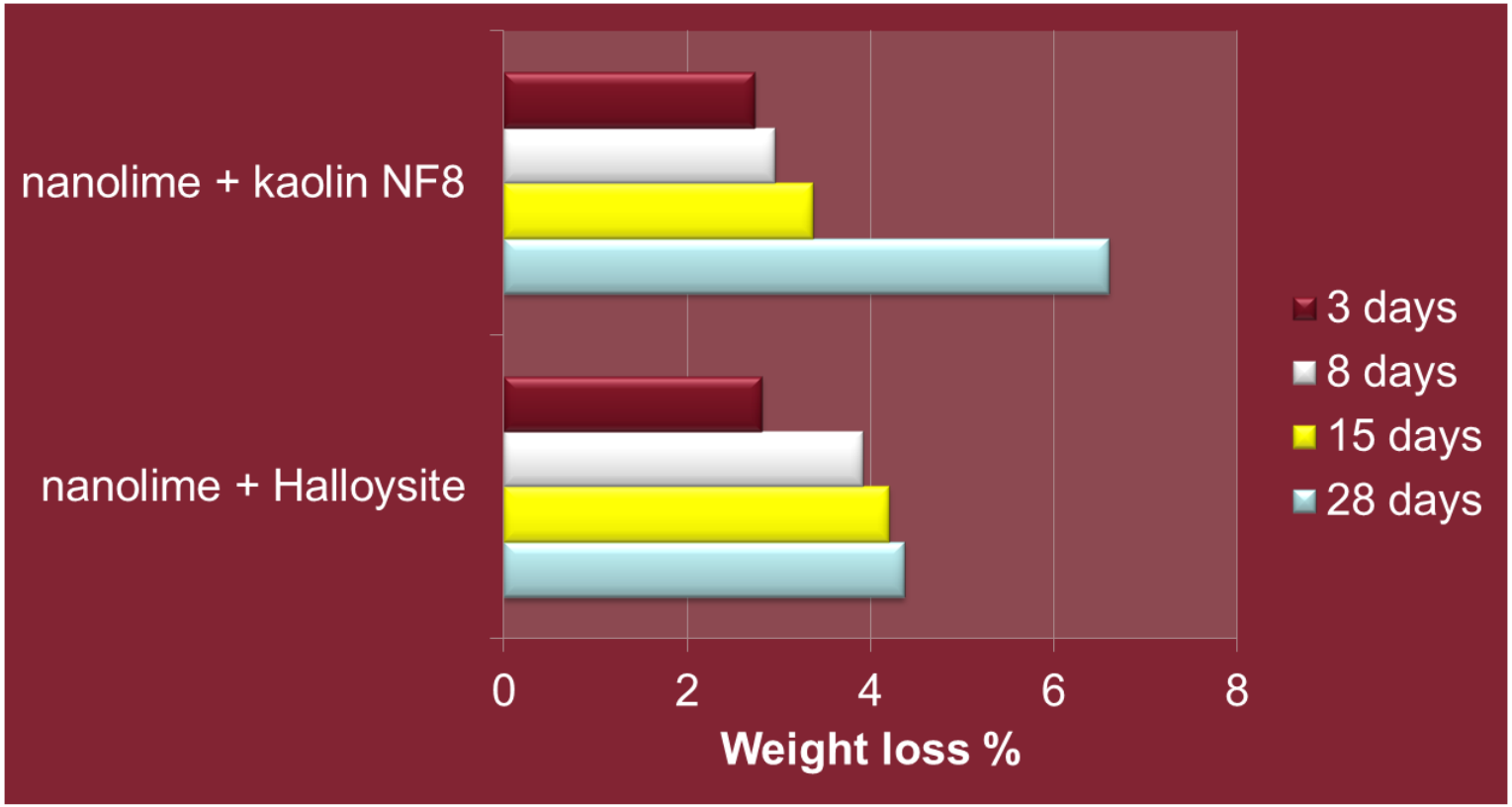
Mortars preparation

Binder : nanolime	
Aggregates: Halloysite, Kaolin NF8	
Binder : Aggregate = 1:3	(weight ratio)
Water / Solid = 1,8	(weight ratio)
Curing age: 28 days	
Curing conditions: RH= 50 %	

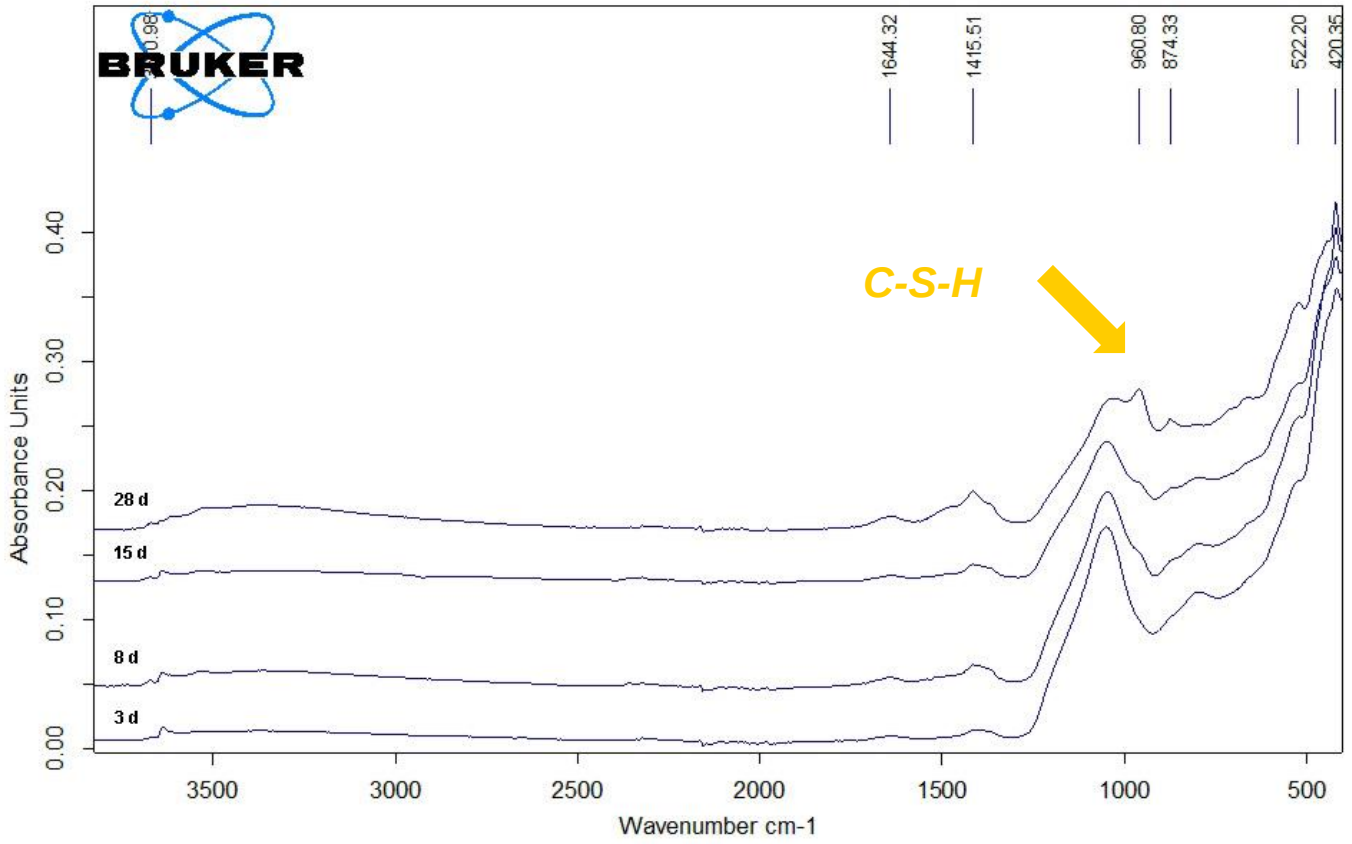
Thermogravimetric analysis



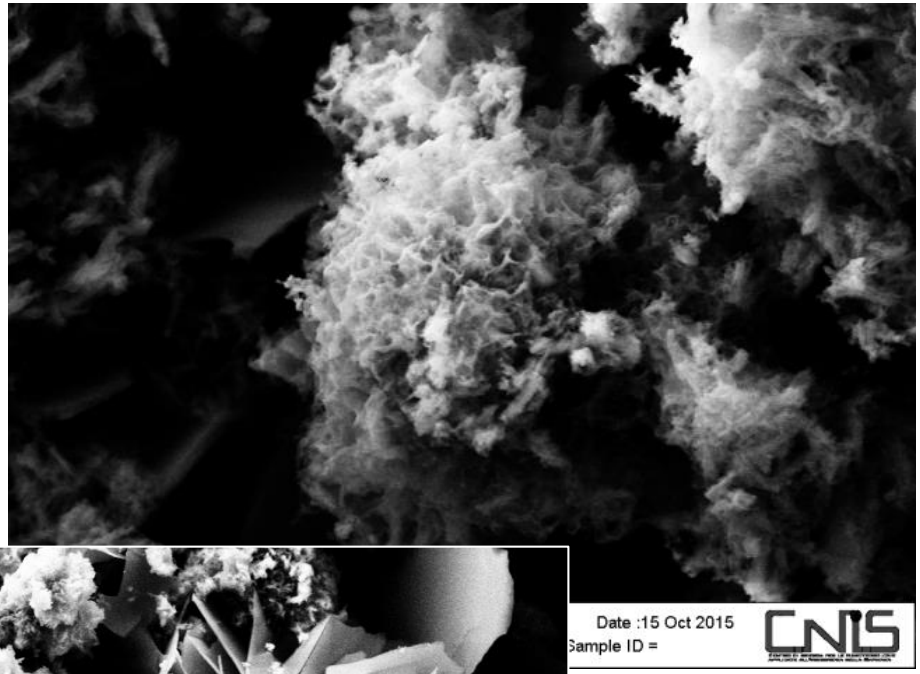
Hydraulic products

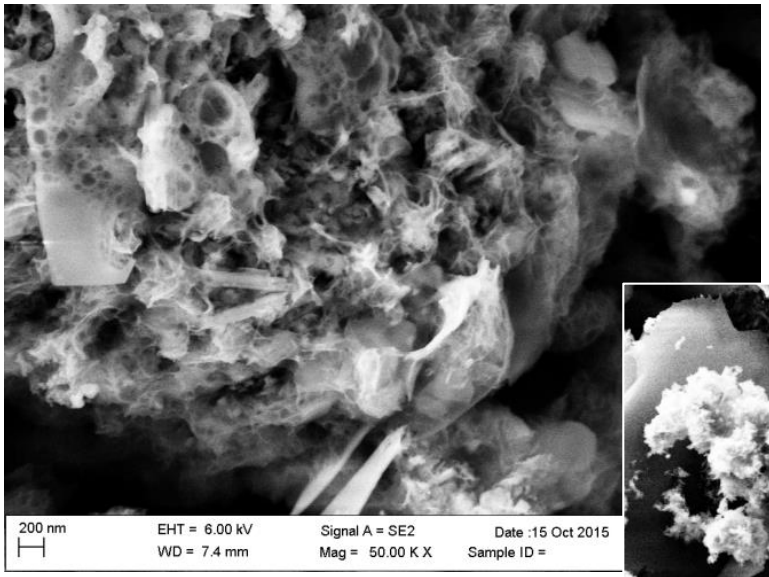


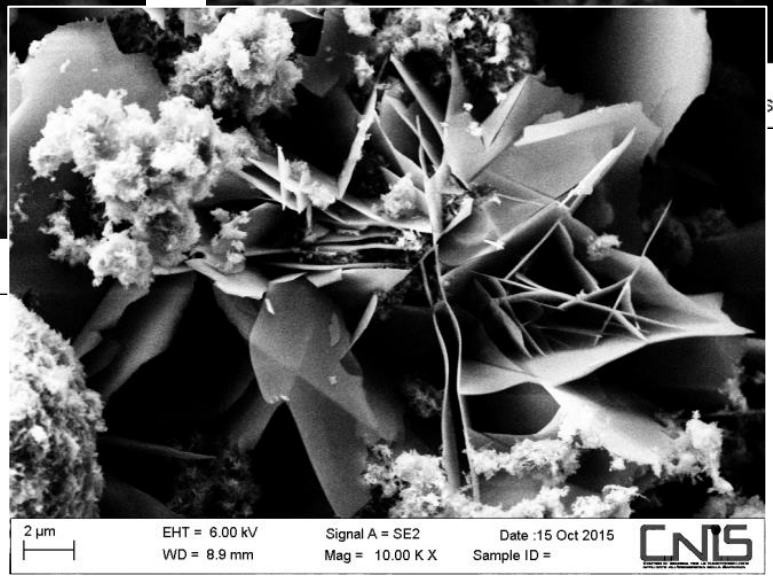
FTIR analysis



SEM Analysis

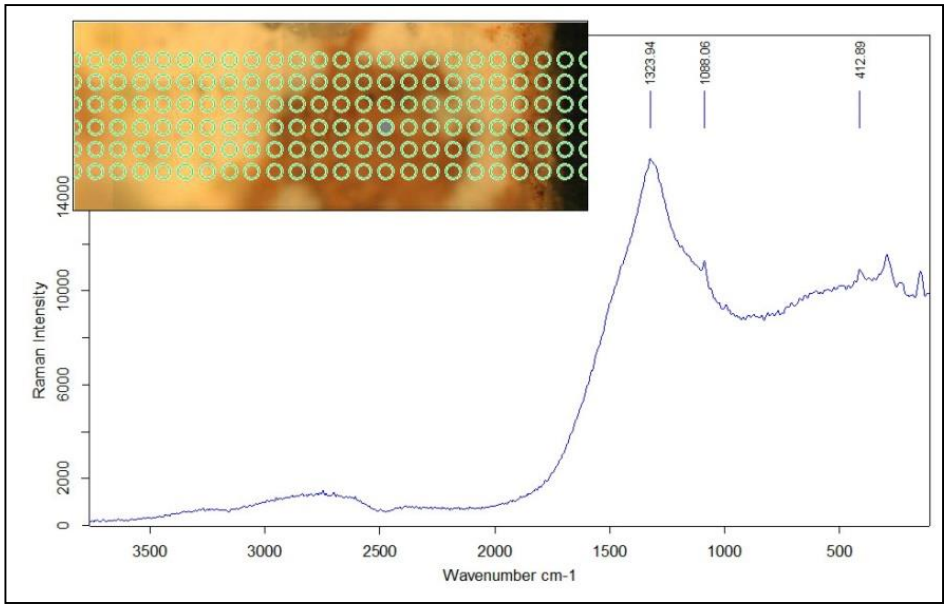


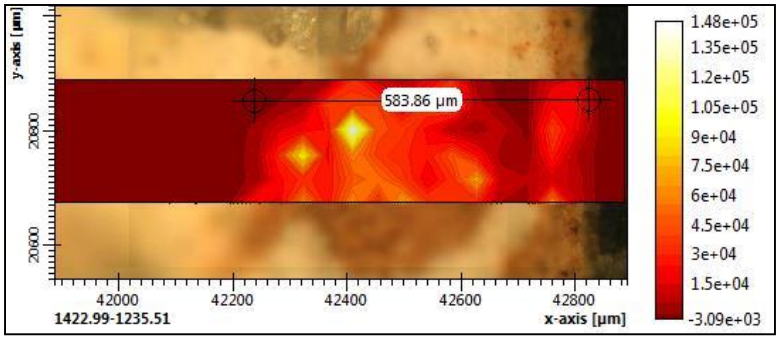


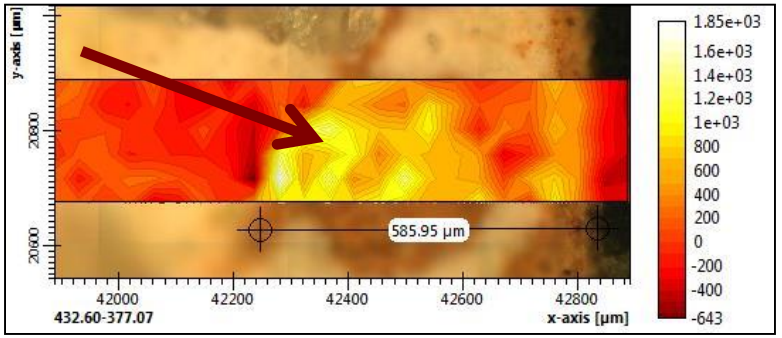


Micro Raman Mapping

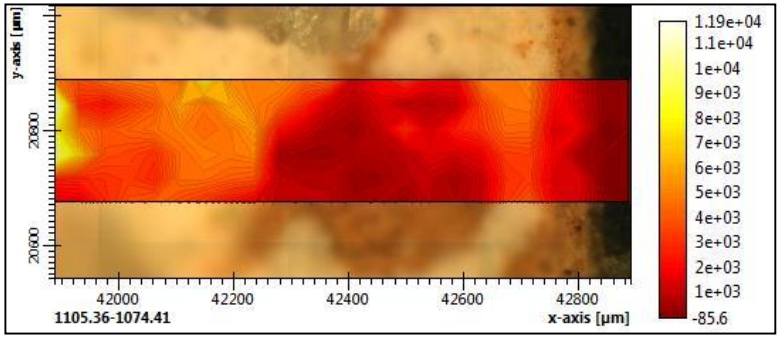
Penetration depth on carbonatic substrates





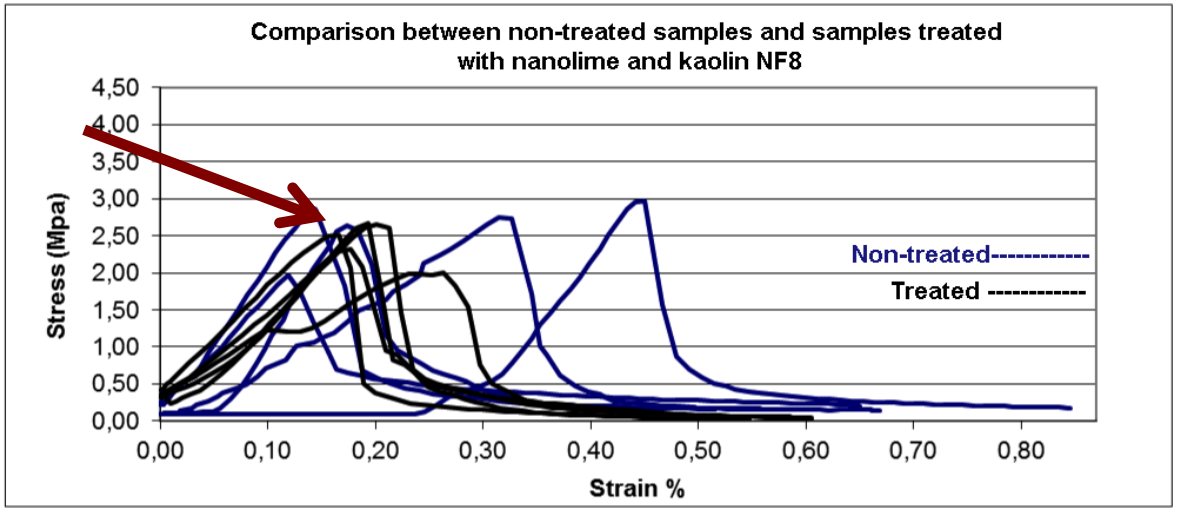


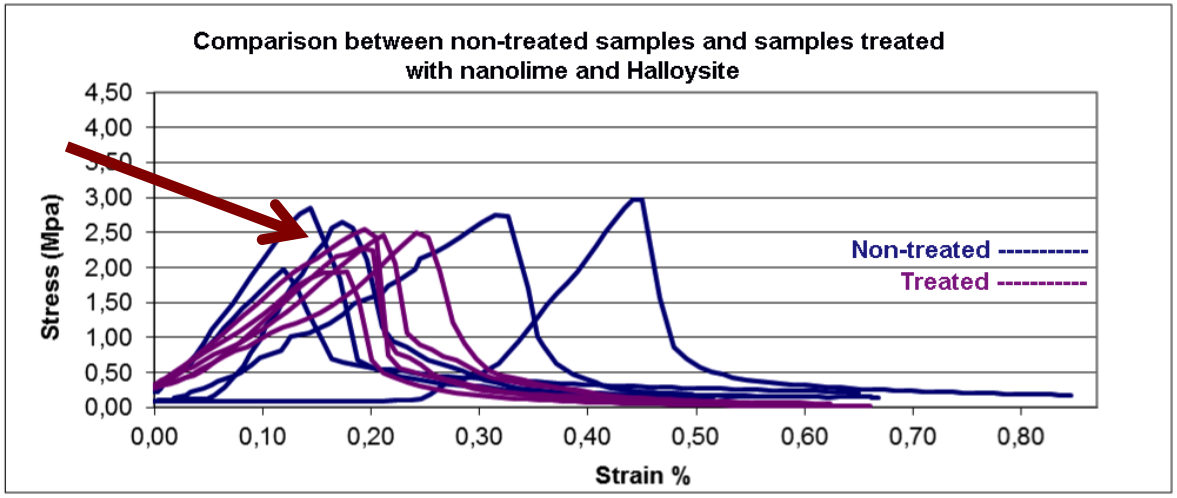
Nanomortar



Calcium Carbonate

Flexural strength





Thanks for your attention!