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Properties of calcitic and dolomitic lime mortars used for rendering purposes

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There exist conflicting aspects in the use of calcitic or dolomitic lime for the elaboration of repair mortars. On one hand, dolomitic lime mortars show higher mechanical strength and lower porosity than calcitic lime mortars. On the other hand, they require the use of bigger amounts of kneading water, which results in higher shrinkage values.

The aim of this work was to find out the differences in the fresh and hardened properties of calcitic (CL90-S) and dolomitic lime (DL85-S) mortars prepared with the same proportions and aggregate types (siliceous and calcareous) in order to establish which one perform better as rendering material.

More than 7% of water was used in mortars of dolomitic lime with siliceous aggregate and 4% for those with calcareous aggregate to achieve values of consistence similar to those of the corresponding calcitic lime mortars. This is due to the higher specific surface of the dolomitic lime, which results in a better workability in the fresh state. However, as consequence of the use of more kneading water, the dolomitic mortars showed the highest shrinkage, which caused big fissures in the matrix of the mortars.

Regarding mortars carbonation, a higher percentage of portlandite is transformed into calcite in dolomitic lime mortars during the first two months of carbonation, but this does not means that dolomitic mortars are more carbonated than calcitic ones. In fact, the amount of calcite formed after this period is higher in calcitic lime mortars by about 7%. The reason is that, although mortars were prepared with the same lime proportion, only a 50% of the dolomitic lime, corresponding to portlandite ($Ca(OH)_2$), is involved in the carbonation process, a 40% less than in calcitic lime. The rest of the binder is composed by brucite ($Mg(OH)_2$) and its quantity has been found almost unvaried after two months of carbonation.

Interesting differences were found in the porous system of calcitic and dolomitic lime mortars, even if porosity values are similar and ranging between 34 and 36% in all mortars. Calcitic lime mortars show a unimodal pores size distribution curve, with the main size of pores radius comprised between 0.1 and 1 μm, which is typical of aerial lime. In dolomitic mortars we obtained two ranges of pores whose size are at $0.01<r<1$ μm and $2<r<15$ μm. N_2 adsorption analyses confirmed that dolomitic lime mortars are characterised by higher volume of nanopores. The volume of the larger pores is higher in dolomitic mortar prepared with siliceous aggregate, which showed the highest shrinkage and the lowest mechanical strength. In a similar way, dolomitic lime mortars with calcitic aggregate exhibited lower values of strength than the corresponding calcitic lime mortars. The capillary absorption is much slower in calcitic lime mortars although they were saturated with a high amount of water at the end of the hydric test. This fact is strictly related with the porous system of the mortars. In fact, in the case of dolomitic mortars there are many large pores which can be saturated by water more quickly than the smaller pores present in calcitic lime mortars.

From the data obtained in this research and considering the poor quality of the dolomitic lime mortars here investigated, the use of calcitic lime, mixed with a calcareous aggregate, has to be preferred for the elaboration of rendering mortars.

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