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Mineralogical investigations on pozzolanic dolomitic lime mortars to assess the phase development at different curing conditions

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For a long time, historical mortars were primarily associated with mortars based on calcium carbonate as the main binder phase. Recent publications show that considerable amounts of magnesium are often present in the binder of historical mortars, which is referred to the use of dolomite rock as raw material (Diekamp, 2009; Diekamp, 2014). A special feature are Roman and medieval dolomitic lime mortars with the addition of brick fragments as a pozzolanic component (Schidlowski, 2019). In order to characterize the phase formation in modern pozzolanic dolomitic lime mortars, mortar prisms based on dolomitic lime were produced with three different pozzolans (antique and modern brick dust and metakaolin). To draw comparisons with other binders, identical prisms based on calcite and magnesite were produced. These specimens were stored under different environmental conditions (60 % and 95 % relative humidity) and examined by X-ray diffraction and simultaneous thermal analysis after periods of 28, 90 and 180 days.

The results obtained so far show that the binder phases that have evolved in the mortars based on dolomitic lime are calcite, aragonite, portlandite, brucite and AFm phases. Aragonite is only found in traces in the samples with metakaolin. In contrast to the samples stored at 65 % relative humidity, the samples stored at 95 % relative humidity have lower calcite and higher contents of portlandite and AFm phases.

No significant differences in the amount of calcite and water-containing mineral phases (portlandite, brucite, hydrotalcite) can be found after 28, 90 and 180 days. It can be concluded that a large part of the reactions has already taken place after 28 days.

The present study is believed to be beneficial for a thorough understanding of the phase formations in dolomitic lime based mortars at different curing conditions.