

## **BURNING EXPERIMENTS ON CALCAREOUS NANNOFOSSILS – CONTRIBUTION TO A BETTER UNDERSTANDING OF HISTORIC MORTAR PRODUCTION**

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Calcareous nannofossils are calcitic fossil remains < 30 µm of single-celled marine photoautotrophic algae. Since their appearance in the Late Triassic (about 209 Ma) these algae have been important primary producers in the oceans and are thus present in many marine sediments. These sediments are used as raw material for lime-based mortars. The limestones (CaCO<sub>3</sub>) are heated approx. up to 900°C. The burning causes the thermal decomposition of CaCO<sub>3</sub> into CaO (=quicklime) and CO<sub>2</sub>. The very reactive quicklime is slaked with water, producing Ca(OH)<sub>2</sub> (=lime). In a last step, lime reacts with CO<sub>2</sub> of the atmosphere, forming again solid CaCO<sub>3</sub>. Unexpectedly, we have encountered remains of these algae in historic mortars and mortar-based materials. To gain a better understanding of the behaviour of calcareous nannofossils during the burning procedure, four samples were heated to nine temperature levels (100°C, 300°C, 500°C, 600°C, 700°C, 750°C, 800°C, 850°C, 900°C). Both, original and heated, samples were analysed with respect to their nannofossil content and preservation by using settling slides. Our results show a decrease of absolute numbers and preservation from 500°C onwards, nannofossils are preserved up to 900°C. Changes in the relative abundance of individual species show that some taxa are more heat resistant than others. This pattern is explained by different crystal sizes and forms. The abundance of calcareous nannofossil, their preservation and the presence / absence of different nannofossil taxa can therefore be used for estimating the burning temperature during the quicklime production. Our study helps to gain a better understanding of historic mortar production. It will also supply information for the preservation of monuments, because new mortars can be made with the same material and under the same conditions like those in the past.