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Universität für angewandte Kunst Wien
University of Applied Arts Vienna

Mag.art. Dr.rer.nat. Elisabeth Mascha

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VISUALIZATION OF CONSOLIDANTS IN THE PORE SPACE
OF MINERAL MATERIALS IN CONSERVATION

Summary:

Diverse microstructural defects of monumental stones are frequently caused by weathering processes induced by various environmental conditions. Consolidation of these defects is therefore one of the most important issues in conservation. Since this intervention is generally irreversible, it is a delicate task that requires a particularly sensitive approach. Laboratory test protocols are essential for the selection of suitable consolidants, especially for new products for which no empirical data exist.

Mechanical and physical states testing of homogeneous specimens yields indirect information on the strengthening effect of a consolidant, but such standard test methods do not take account of the variety of defects and their depth gradients within a weathered material. Due to their high topographic resolution, SEM studies are unsurpassed for the determination of a consolidant with regard to its spatial distribution, ability to adhere grains, and shrinkage and bridging properties in pore systems.

The present work, performed within three EU projects, demonstrates SEM as core method in systematic protocols designed to capture specific properties of consolidants in the pore space of mineral materials. Part A includes a methodological section on the preparation of mockup specimens according to the research question and on the detection, qualification and quantification of consolidants. Part B highlights the specific properties of commercial TEOS systems vs. novel inorganic nano consolidants and nano-modified TEOS products. General benefits and shortcomings of the tested consolidating systems are illustrated in respect to characteristic microstructural defects for diverse lithotypes and discussed in view of the practice of stone conservation.