Preservation of murals with electrokinetic - with focus on desalination of single bricks - DTU Orbit (17/08/2019)

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Salt induced deterioration of murals is in several cases ongoing in Danish churches. The murals are one of the main objects of our Danish Cultural Heritage. Existing applied methods for desalination of salt contaminated church vaults are based on indirect affection of the dissolved salts (ions) through physical properties of the materials and are unfortunately only limited efficient. The purpose with this Ph.D. project was to clarify the effect and possible use of an electrochemical method termed electrokinetic (application of an electric DC field) as transport mechanism. The overall aim with the study was to obtain an accelerated and more efficient ion transport of the polluting dissolved salts out of church vault constructions to reduce future deteriation of murals. A major part of the work was related to optimization of the electrochemical ion transport effect. A special poultice was developed to optimize the desalination effect. After improvement of the poultice, desalination from high and problematic ion content could be reduced to low and unproblematic ion content in single bricks. A patent application was handed in April 2008 and an international PCT patent application has recently followed. Besides the experiments on optimized laboratory setups the very first desalination of a wall section with murals was documented. In addition it was shown that the specific brick type and its pore system influences the electrochemical iontransport and coherence between the ion content in the pore water and possible electrochemical iontransport and coherence between the ion content in the pore water and possible electrochemical dewatering was found. Through examination of deterioration causes in praxis it was seen that sulphates seems to induce deterioration whereas presence of sodium chloride only accelerated the deterioration.

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