

SOME MATHEMATICAL MODELS FOR UNDERSTANDING AND PREVENTING DAMAGE ON CULTURAL HERITAGE

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In this talk, we present a general survey about a series of works we have done in the last twenty years, with our group, on chemical aggression of stone artifacts. We consider here different problems such as modelling the evolution of gypsum crust in marble stones, the sodium sulphate crystallization inside porous stone (masonry brick), or the effect of the injection of consolidants in stones.

For sulphation and other surface reactions we adapted our previous models to take into account more possible features, as for instance rugosity of the stone and the possible interaction between chemical and mechanical damage, to evaluate the propagation of cracks in stones under stress. For the problem of salt crystallization, a new mathematical model describing the effect of protective products on sodium sulphate crystallization inside bricks has been proposed and tested against experiments. A numerical fitting procedure of the parameters of model for both the case of the brick treated with a protective product and untreated case are implemented. Numerical results show the effectiveness of our method, since we obtain a low average error.