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A model for ion transport during drying of a porous medium LAURA GUGLIELMINI, ALEXANDRE GONTCHAROV, SEAS, Harvard University, ANTONIO ALDYKIEWICZ, Grace Construction Products, HOWARD STONE, SEAS, Harvard University — Salt crystallization at the surface or in the body of a porous medium has been recognized as a major mechanism in the deterioration of construction materials and historical monuments. Crystal formations on the surface of bricks, concrete, stones, called efflorescences, lead to fast obsolescence of building and monuments finishing, while crystal growth inside the material, called subflorescences, causes crack formation, which may lead to major structural damages. A number of studies have been devoted to the analysis of crystal growth in an elementary pore and aim at explaining the stress generated by crystallization. From a fluid mechanical point of view the physics of water transport and salt distribution in the porous medium turns out to be quite complex, since it is a function of the pore structure and wettability characteristics, of granule size and of the thermal properties of the material. It also depends on the transient environmental conditions the surface is exposed to and on the effective diffusivity of salt at different saturation conditions. We present here a simple theoretical model of the first phase of the drying process, during which water is uniformly distributed throughout the medium and often efflorescences occurs, which aims at characterizing the physics involved in the process.

Laura Guglielmini
laurag@seas.harvard.edu
SEAS, Harvard University

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