Moisture dynamics in built structures: the role of evaporative pumping

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Abstract

Research on water transport in porous construction materials, not least concrete, is concerned predominantly with intrinsic engineering properties such as permeability, sorptivity and water retention, and the relation of these quantities to composition and microstructure. Less attention is given to understanding the exchanges of water between materials and the environment, although this essential in predicting the long-term performance of built structures.

I review some recent work on the moisture dynamics of masonry structures which shows the important role of *evaporation* in driving long-term water flux. Evaporative pumping, although largely invisible, is a powerful mechanism, and the associated water fluxes can be extraordinarily large. I discuss (a) the microenvironmental factors that control the evaporation boundary condition; (b) the significance and variation of the hydrological quantity *the potential evaporation;* (c) the behaviour of a dynamic model of moisture balances in walls; (d) the long-term chemomechanical damage caused by evaporative pumping; and (e) the relevance of these results to concrete structures.