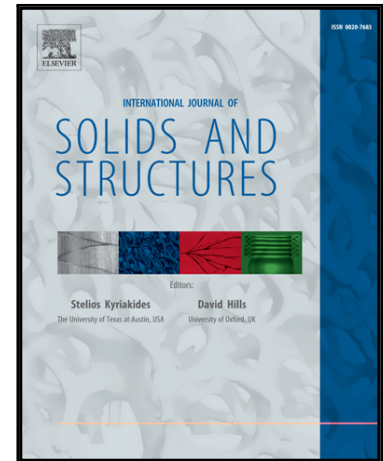


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A multi-scale approach for the analysis of the mechanical effects of salt crystallisation in porous media

L. Grementieri^a, F. Daghia^b, L. Molari^a, G. Castellazzi^a, H. Derluyn^{c,1}, V. Cnudde^c, S. de Miranda^{a,*}

^a*DICAM, Alma Mater Studiorum - Università di Bologna, Viale Risorgimento 2, 40136 Bologna, Italy*

^b*LMT (ENS de Cachan, CNRS, Univ. Paris-Saclay), 61, avenue du Président Wilson, F-94235 Cachan, France*

^c*PProGress-UGCT, Ghent University, Krijgslaan 281/S8, B-9000 Ghent, Belgium*

Abstract

In this paper, a multi-scale approach for the analysis of mechanical effects induced by salt crystallisation in porous media is presented. The approach is based on numerical homogenisation and allows to predict the effects of salt crystallisation occurring at the scale of the structure, based on the real 3D micro geometry of the porous material coming from X-ray Micro Computed Tomography images. The micro-mechanical model is obtained by automatically converting the images into a finite element mesh. **The macro-scale distribution of the crystallized salt is assumed as an input datum coming from Hygro Thermal Chemical models available in the literature.** Then, some hypotheses on the loading condition of the micro-mechanical model, accounting for different crystallisation physics, are introduced and their effects in terms of mechanical response at the macro-scale are compared. As case study, the proposed approach is applied to the Prague sandstone. Results show that the macro-scale mechanical effects are influenced by the loading scheme and that some approaches commonly used in the literature for their evaluation can lead to their underestimation. The proposed approach can be incorporated in a structural computation with environmental-

*Corresponding author

Email address: stefano.demiranda@unibo.it (S. de Miranda)

¹Current affiliation: CNRS/TOTAL/Univ. Pau & Pays Adour, Laboratoire des fluides complexes et leurs réservoirs-IPRA, UMR5150, 64000 Pau, France

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