COMPARISON OF NUMERICAL SOLVERS APPLIED TO LEACHING AND ACCELERATED CARBONATION OF CONCRETE

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Keywords: Multiphase flow, porous media, carbonation, leaching, porosity change, finite volume.

We study cementitious material subject to carbonation and leaching under accelerated laboratory experiment conditions. Our model consists of two phase flow of water and air in a porous medium, transport of agents: Ca ions in water and CO_2 concentration in air, and above mentioned chemical reactions. Chemical reactions are simplified to nonlinear source terms [1], and are affecting the porosity of the medium. Due to accelerated nature of the setup, carbon dioxide concentration is much higher than usual, which results in a sharp carbonation front.

The position of the carbonation front relative to the mesh has a significant effect on the convergence of scheme. We present a comparison of several solvers highlighting their robustness to this property: global implicit or various iterative operator splitting approaches, solved with standard Newton or RASPEN method [2]. All solvers use vertex centered finite volume method implemented in PDELab module, a part of DUNE project [3].

References

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