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

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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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[3] DUNE project web-page: https://dune-project.org/.

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