A robust mass-conservative scheme for two-phase flow in porous media

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ABSTRACT

Among the plenty applications of two-phase flow in porous media we mention water and soil pollution, oil recovery or nuclear waste management. These applications are connected to problems of a strong interest for the society and therefore the understanding of two-phase flow in porous media is of a high relevance. A crucial role in understanding two-phase flow in porous media is played by numerical simulations, including mathematical modelling and numerical schemes.

This presentation is focusing on a mass conservative numerical scheme for two-phase flow in porous media. The scheme is based on backward Euler and mixed finite element method. More exactly, the lowest order Raviart-Thomas elements are used. Error estimates will be shown to certify the convergence of the scheme. For the linearization a robust, first order convergent iterative scheme is proposed. The scheme is based on the ideas in [1, 2] and it is a valuable alternative for the Newton method, see e.g. [3] in the context of mixed finite elements and degenerate parabolic equations. Finally, relevant numerical examples will be shown to sustain the theoretical results.

References

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