

Upwind Finite Volume Scheme for Compressible and Immiscible Two-Phase Flows in Porous Media

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We will present an industrial scheme, to simulate the two compressible phase flow in porous media. This scheme consists in an implicit finite volume method together with a phase-by-phase upstream scheme which satisfies industrial constraints of robustness. We show that the proposed scheme satisfy the maximum principle for the saturation and a discrete energy estimate on the velocity of each phase. These stabilities results allow us to derive the convergence of a subsequence to a weak solution of the continuous equations as the size of the discretization tends to zero. The proof is given for the complete system without simplified assumptions on the density of each phase, we consider that the density of each phase depends on its corresponding pressure. In addition, we present some numerical tests in 2D on an unstructured mesh for water-gas flows in porous media.