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About A Time Discretization of A New Mathematical Model of Two-Phase Flow in Nanoporous Media

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SUMMARY

We propose a mathematical model for two-phase flow in nanoporous media. Unlike classical models, our model suppose the relative permeabilities depend not only on saturation but also on pressure or the gradient of pressure. Using usual laws of flows in porous media we obtain a system of two nonlinear partial differential equations, the first is elliptic and the second is parabolic degenerate. To solve our system, we begin by regularizing the degenerate equation by adding a vanishing term to the coefficient causing the degeneracy. The aim of this communication is to prove the existence of a weak solution of a time discrete version of the regularized model.

Keywords: Nanoporous media, Time discretization, Galerkin's approximation,...

References

[1] Zhangxin Chen & Guanren Huan & Yuanle Ma, *Computational Methods for Multiphase Flows in Porous Media*, Siam, Philadelphia, 2006.

[2] Brahim Amaziane & Mladen Jurak, *A new formulation of immiscible compressible two-phase flow in porous media*, 2007.

[3] Brahim Amaziane, Mladen Jurak & Anja Vrbaški, *Existence for a global pressure formulation of water-gas flow in porous media*, Electronic Journal of Differential Equations, Vol. 2012 (2012), No. 102, pp. 122.

[4] Haim Brezis, *Functional Analysis, Sobolev Spaces and Partial Differential equations*, Springer, New York, 2011.

[5] Paulo J.M. Monteiro, Chris H. Rycroft & G.I. Barenblatt, *A Mathematical Model of Fluid and Gas Flow in Nanoporous Media*, (2012).

[6] Zhangxin Chen, *Degenerate Two Phase Incompressible Flow I, Existence, Uniqueness and Regularity*, (1999).

[7] Sandro Salsa, *Partial Differential equations in Action, From Modeling to Theory*, Springer, Italy, 2008.

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