

Hybridizable discontinuous Galerkin method for two phase flow problems

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ABSTRACT

Two-phase flow in porous media is widely used in petroleum reservoir simulation, during the secondary phase of the oil recovery process. This stage consists in the injection of water, the wetting phase, to mobilize the oil, the non-wetting phase, through the porous media.

The governing equations of this scenario are derived from combining for each phase, mass conservation with Darcy's law. This leads to a coupled non-linear system of transient PDE's [1]. Improving the efficiency and the accuracy of numerical models to solve these equations is of the major importance during for the planning, management and environmental analysis of oilfields [2].

We present a high-order hybridizable discontinuous Galerkin formulation (HDG) [3] to solve the two-phase flow problem in a heterogeneous porous media. In particular, we apply the HDG formulation in two different schemes, the *fully implicit*, and the *implicit pressure, explicit saturation* (IMPES).

Finally, several examples are presented in order to illustrate and discuss the main features of the proposed formulation.

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