COUPLING OF DISCONTINUOUS GALERKIN SCHEMES FOR VISCOUS FLOW IN POROUS MEDIA WITH ADSORPTION

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Abstract. Polymer flooding is an important stage of enhanced oil recovery in petroleum reservoir engineering. A model of this process is based on the study of multicomponent viscous flow in porous media with adsorption. This model can be expressed as a Brinkman-based model of flow in porous media coupled to a nonstrictly hyperbolic system of conservation laws for multiple components (water and polymers) that form the aqueous phase. In this talk we give a description of the proposed discretization for this coupled flow-transport problem, the discretization combines an H(div)-conforming discontinuous Galerkin (DG) method for the Brinkman flow problem with a classical DG method for the transport equations. The DG formulation of the transport problem is based on discontinuous numerical fluxes. An invariant region property is proved under the (mild) assumption that the underlying mesh is a B-triangulation [B. Cockburn, S. Hou, and C.-W. Shu, Math. Comp., 54 (1990), pp. 545581]. This property states that only physically relevant (bounded and nonnegative) saturation and concentration values are generated by the scheme. We present as well the numerical tests which illustrate the accuracy and stability of the proposed method.

Keywords: multicomponent viscous flow in porous media, coupled flow-transport problem, discontinuous Galerkin method, invariant region property, polymer flooding, enhanced oil recovery.

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