Modeling and simulation of multiphase multicomponent porous media flows in the context of chemical enhanced oil recovery

In this talk, we will describe the basic principle behind development of a unified framework for modeling immiscible and miscible multiphase fluid flow through highly heterogeneous porous media. In particular, we will discuss a model based on this principle for chemical enhanced oil recovery (EOR) which involves the use of complex flooding schemes comprising of various layers of fluids mixed with suitable amounts of chemicals such as polymer or surfactant or both. A new hybrid method based on a combination of a discontinuous finite element formulation and the method of characteristics will be used to solve the system of partial differential equations governing the fluid flow. Numerical results based on this method will be presented. In particular, we will numerically study the effects of various types of heterogeneity and surfactants on the flow pattern. Time permitting, we will discuss some fundamental flow models of various flooding schemes and how they can play a role in the efficient design of flooding schemes.

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