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Compositional two-phase fluid flow in porous media: from the pore scale to Darcy's scale

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Compositional two-phase fluid flow in porous media, especially on geometrically complex domains, require high fidelity geometric discretization. Moreover, since multi-component multi-phase flow and transport in porous media usually come with strong nonlinearity and stiffness in multiple spatial and temporal scales, it is necessary to deploy a multi-scale approach that is inevitably memory-intensive and time-consuming, requiring robust and high-accurate algorithms as well as high-performance computing infrastructure. We present an overview of recent advances in simulations of multi-component two-phase fluid flow in porous media at Darcy's scale and at the pore scale as well as their coupling. We discuss the modeling and computational techniques for both conventional and unconventional petroleum reservoirs, in particular the non-Darcy flow in tight geological formation.

References

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