Contribution ID: **529** Type: **Oral Presentation**

A numerical approach to incorporating shear thinning effects of polymer in polymer flooding.

Tuesday, 31 May 2022 11:15 (15 minutes)

In mathematical modeling of chemical enhanced oil recovery by polymer flooding, it is desirable that non-Newtonian effects of polymer are properly accounted for. The two distinct effects that polymers exhibit are shear-thinning (stiff polymer) and visco-elasticity (flexible polymer). The shear thinning effect is important as the polymers used in chemical oil recovery are usually stiff polymers. We propose a data driven approach to incorporate this shear thinning effect. We describe the way we integrate this data driven approach with the hybrid numerical method for reservoir simulation, previously developed by Daripa and Dutta. The numerical method solves a system of coupled elliptic and transport equations modeling the polymer flooding process through heterogeneous porous media using a discontinuous finite element method and modified method characteristics. The simulations show (i) competing effects of shear thinning and mobility ratio; (ii) injection conditions such as injection rate and injected polymer concentration influence the choice of polymers to optimize cumulative oil recovery. (iii) permeability field also affects the choice of polymer as polymers show varying movement for different shear rates that are caused by heterogeneity; and (iv) shear thinning leads to complex fingering patterns with narrower fingers affecting the flow and displacement efficiency.

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Time Block Preference

Time Block B (14:00-17:00 CET)

Participation

Online

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Session Classification: MS07

Track Classification: (MS07) Mathematical and numerical methods for multi-scale multi-physics, nonlinear coupled processes