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# New Insights and Mechanisms for Chemical Enhanced Oil Recovery using Polymers

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Water-based polymers are often used to improve oil recovery beyond a waterflood by improving the mobility ratio and increasing sweep efficiency. However, polymer floods are not expected to affect residual (trapped) oil saturation. In this work, it is shown hat polymers, particularly those that are viscoelastic, can reduce residual oil saturation.

Bentheimer and Berea sandstone cores were saturated with either high (120cp) or low (< 10 cp) viscosity oil and then waterflooded to residual oil saturation. These floods were followed by injection of a water-based polymer, hydrolyzed polyacrylamide (HPAM), that was non-Newtonian and viscoelastic. Significant reduction in residual oil saturation was observed for all core floods when the polymer had significant elasticity, which contradicts conventional wisdom of the efficiacy of polymer flooding (improved sweep but not recovery of capillary trapped oil). Experiments in glass microfluidic channels and micromodels show unique flow behavior, including oscillation of oil droplets, at pores. Computational fluid dynamics modeling is used to explain the pheneomena by calculating the forces acting on a trapped oil droplet by a viscoelastic fluid. Finally, field scale simulations are performed for a real pilot study using a chemical flooding reservoir simulator. It is shown that viscoelastic polymer results in significantly larger recovery than even polymer floods that are not viscoelastic.

## References

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