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Oil drainage in model porous media by viscoelastic fluids JULIEN BEAUMONT, HUGUES BODIGUEL, ANNIE COLIN, Laboratoire du Futur (UMR 5258) — Crude oil recovery efficiency has been shown to depend directly on the capillary number (Ca). If the capillary phenomenon is well described for Newtonian fluids, the consequences of non linear rheology and viscoelasticity require more experimental work at the pore scale. In this work we take advantage of microfluidic to revisit this field. We carried out oil drainage experiments through a micromodel made up with photoresist resin. The wetting phase trapped is a model oil. The invading phases used are aqueous solutions of high molecular weight hydrolyzed polyacrylamide (HPAM) and surfactant. Qualitatively, we observed a transition between a capillary fingering at low flow rates and a stable front at high flow rates for the drainage experiments with HPAM and surfactant solutions as it happened for drainage with Newtonian fluids. From movies of the filling of the device, we determine the local velocity of all menisci in the porous media. Thus, we quantify the capillary fingering. Surprisingly, local velocities are not significantly different from those measured using water, whereas the HPAM solutions are much more viscous. With betaine solutions, we observed an emulsification of the oil clusters trapped during the invasion leading to a very high oil recovery after percolation.

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