Branched Polymers for Enhanced Oil Recovery

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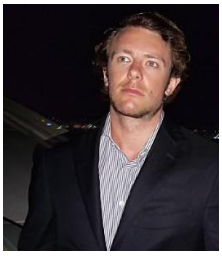

Description of research

In the field of Enhanced Oil Recovery (EOR), water soluble polymers are used in polymer flooding to enhance the viscosity of the aqueous phase, in order to obtain a viscosity comparable to that of oil. Previous research [1] has indicated the relevance of branched structures for maximizing the viscosity as function of polymer consumption (displayed in Figure 1).

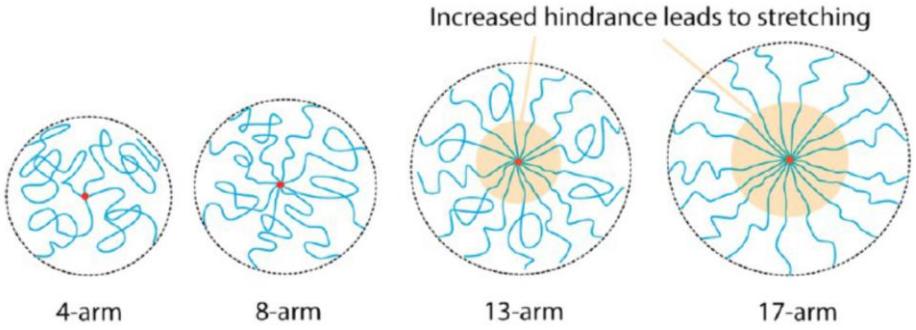

Figure 1. Increase in solution viscosity due to increase in particle size (poly acrylamide) [1]

In the current research, new innovative methods for the preparation of acrylamide containing polymers for Enhanced Oil Recovery (EOR) are investigated, in particular by taking into account the various criteria that are industrially relevant to envision an application of these polymers in an oil reservoir.

Figure 2. Flow-cell after 24h brine (30.000 ppm) flood, recovering 42% of oil in place

After synthesis, polymers are initially evaluated based on their rheological behavior. Further selection of polymers involves applications tests, e.g. recovering oil from a flow-cell resembling an oil field by containing 'dead-ends' with different pore sizes (depicted in Figure 2) and subsequently from a sandstone core with a predetermined porosity. Hereafter, long term stability, resistance to salts (monovalent and divalent ions), and plugging are regarded. The project is sponsored by the Dutch Polymer Institute and is executed in collaboration with Shell, SNF, and TU Delft.

[1] D. A. Z. Wever, L. M. Polgar, M. C. A. Stuart, F. Picchioni and A. A. Broekhuis, "Polymer Molecular Architecture As a Tool for Controlling the Rheological Properties of Aqueous Polyacrylamide Solutions for Enhanced Oil Recovery," *Ind. Eng. Chem. Res.,* p. 16993–17005, 2013.