

Accepted Manuscript

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PII: S0920-4105(17)30716-7

DOI: [10.1016/j.petrol.2017.09.011](https://doi.org/10.1016/j.petrol.2017.09.011)

Reference: PETROL 4254

To appear in: *Journal of Petroleum Science and Engineering*

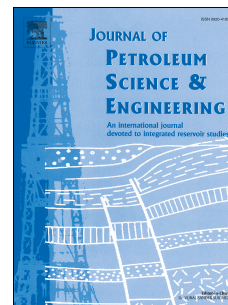
Received Date: 5 April 2016

Revised Date: 8 September 2017

Accepted Date: 10 September 2017

Please cite this article as: Zamani, N., Bondino, I., Kaufmann, R., Skauge, A., Computation of polymer in-situ rheology using direct numerical simulation, *Journal of Petroleum Science and Engineering* (2017), doi: 10.1016/j.petrol.2017.09.011.

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1 Computation of polymer in-situ rheology 2 using direct numerical simulation

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8 *Abstract*

9 *In-situ rheology of synthetic polymers like hydrolyzed polyacrylamide, HPAM, cannot be directly*
10 *calculated from bulk rheology. The in-situ viscosity of polymers will be influenced by shear history and*
11 *local pore structure contraction / expansion. Transition from flux in porous media to bulk shear rate*
12 *requires empirical correlations. The conventional approach for in-situ rheology is to define apparent*
13 *viscosity vs. Darcy velocity and connecting Darcy velocity to bulk shear rate by using a correction factor,*
14 *which generally depends on both polymer and rock properties.*

15 *Estimating polymer in-situ rheology is important for estimation of displacement pressure gradients and*
16 *injectivity in the reservoir. In the following study, different models used to quantify the shear-to-flux*
17 *correction factor are compared by using direct numerical simulation in 3D real rock images. We found*
18 *that the models developed based on capillary bundle approach are not able to predict accurately in-situ*
19 *rheology and microstructures of a rock sample can influence in-situ rheology. A novel approach is*
20 *suggested to provide a more accurate prediction of in-situ rheology by adjusting appropriately bulk power*
21 *index of the Carreau model before applying the correction factor. The pore scale simulations have*
22 *revealed that the key parameters of porous media influencing in-situ rheology are pore aspect ratio and*
23 *inaccessible pore volume.*

24 **Keywords:** Pore scale modeling, apparent viscosity, polymer rheology μ CT rock image, Direct Numerical
25 **Simulation.**

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