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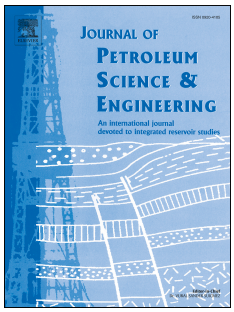

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PII: S0920-4105(17)30824-0

DOI: 10.1016/j.petrol.2017.10.045

Reference: PETROL 4368

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

Received Date: 15 March 2017

Revised Date: 19 September 2017

Accepted Date: 16 October 2017

Please cite this article as: Abedi Lenji, M., Haghshenasfard, M., Vafaie Sefti, M., Baghban Salehi, M., Mousavi Moghadam, A., Numerical modeling and experimental investigation of inorganic and organic crosslinkers effects on polymer gel properties, *Journal of Petroleum Science and Engineering* (2017), doi: 10.1016/j.petrol.2017.10.045.

Numerical Modeling and Experimental Investigation of Inorganic and Organic Crosslinkers Effects on Polymer Gel Properties

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Abstract

Hydrogel treatment is one of the most important chemical methods to reduce excessive water in mature reservoirs. In this study, four hydrogel systems were studied for applying in water shutoff treatments. The hydrogel systems consisted of sulfonated polyacrylamide and chromium triacetate, aluminum nitrate nonahydrate (both as inorganic crosslinkers), polyethyleneimine, and hexamethylenetetramine (both as organic crosslinkers). The effects of polymer and crosslinker concentrations and their interactions on gelation and syneresis times were determined using the central composite design method. Based on the results values, four investigated samples of the hydrogel systems were selected for further rheological and thermal stability investigations. Among the four selected hydrogels, the polyethyleneimine one retained its structure under strains below 2050%. Thus, this system was recommended to use under different reservoir conditions (up to 110 °C). Moreover, it was found that gelation time and gel strength could be controlled by both adjusting polymer and crosslinker concentrations and choosing the right crosslinker type. The results of the study might be used in selecting the proper type of crosslinker in hydrogels based on their gelation time, syneresis time, deformation strength, and thermal stability for specific operating conditions.

Keywords: *Hydrogel, Crosslinker, Gelation Time, Syneresis, Thermal Stability, Strain Sweep*