



Contribution ID: 955

Type: Oral 20 Minutes

Conditions for upscalability of bioclogging in pore network models

Wednesday, 16 May 2018 11:53 (15 minutes)

Microbial Enhanced Oil Recovery (MEOR) is a tertiary oil recovery technique that uses the bacteria and the resulting bio-products to increase oil production. Interfacial tension reduction and selective clogging caused by bacterial growth are the two mechanisms that have the dominating influence in MEOR. Due to lack of information about the chemical properties of bacteria and the characteristics of the reservoir, the application of MEOR in oil reservoirs has led to different results. The development of mathematical models that take into account the heterogeneity of biofilm growth and bioclogging in the microscale is needed for a better understanding of MEOR process at reservoir scales. In this work, we study the development and growth of biofilm at the microscale using a rectangular pore network model which takes into account the possibility of non-uniform biofilm growth. We study the effects of bioclogging on porosity and permeability for different network sizes, pore sizes and for different concentrations of nutrients at the inlet of the network. Finally, we determine and discuss the conditions for upscalability of bioclogging in porous media.

References

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Session Classification: Parallel 7-G

Track Classification: GS 1: Fundamental theories of porous media