The National IOR Centre of Norway

Mineralogical influence on reservoir wetting and Smart Water EOR processes

Preliminary Project Report, 1.1.14

Project manager: Aleksandr Mamonov
PhD students and postdocs: Aleksandr Mamonov, postdoc
Other key personnel: Tina Puntervold, Skule Strand
Project duration: August 2019 - March 2022

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Executive summary

The initial reservoir wetting is of great importance and it affects both oil recovery during water flooding, and Smart Water EOR potential. Although some initial studies have been performed, a systematic investigation on how the mineralogical composition of the reservoir rock, crude oil, formation water and reservoir temperature affect the initial wetting, is still lacking. This postdoc project focuses on gaining a lack of knowledge on the wettability of porous rocks, which can later be used to investigate the potential for wettability alteration during water flooding and to improve the geochemical models for describing fluid-rock interactions.

Introduction and background

Smart Water EOR is one of the most promising EOR methods for NCS, which requires additional research before full field implementation. Understanding of reservoir wetting is a crucial part of a successful Smart Water application, and the main challenge is to investigate complex interactions between components in the Crude Oil-Brine-Rock (COBR) system.

Results

1. Improved understanding of rock wettability in sandstones and carbonates. Within the framework of this project, a significant number of experimental studies were carried out on the adsorption of polar crude oil components onto various mineral surfaces and its effect on rock wettability.
2. Studies of Smart Water EOR potential for low-temperature reservoirs containing asphaltenic oil. Over the past year, a number of experimental studies have been carried out on the applicability of the Smart Water EOR to low-temperature reservoirs containing viscous, asphaltenic oil. This project is a case study within the collaboration between UiS and Kazan University (Russia).
3. Recommended practices. Completed report for the National IOR Centre of Norway: "Laboratory workflow for screening Smart Water EOR potential".
4. Systematization of Smart Water EOR research data. The systematization of Smart Water EOR research data is based on experimental data obtained over the past decade at the University of Stavanger. The data is constantly updated with the latest research results.

Planned dissemination of results

4 research papers are in the process of being written and sent to peer-reviewed journals:

- *Advanced studies of the adsorption of polar crude oil components on sandstone mineral surfaces and its effect on rock wettability*
- *Smart Water EOR potential for low-temperature reservoirs containing asphaltenic oil, case study*
- *Role of Illite Clay Minerals in Enhanced Oil Recovery by Low Salinity Water Injection*
- *Analysis of pH distribution during alkaline and low salinity water flooding in sandstones*