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Wettability alteration in carbonates / Proposed thesis subjects

Processes for alteration of wettability to more water-wet conditions have been developed to increase the spontaneous imbibition of brine in fractured carbonate reservoirs. At University in Stavanger and IRIS wettability alteration processes by changing composition of injection water and by addition of chemicals (e.g. cationic surfactants) have been developed.

Proposed subjects:

Modelling/simulation of wettability alteration processes

The project aims at developing routines/tools that can be used to model wettability alteration processes on laboratory scale and simulate these processes on reservoir scale. Such tools can be used for evaluation of wettability alteration processes at field scale. In the first phase of the project numerical modelling routine for simulation of physico-chemical processes of wettability alteration during water floods on laboratory scale (1-dimensional) will be developed. Students are invited to take part in either experimental or modelling work on the following subjects:

- Dependence of adsorption isotherm with wettability modifier concentration

- Relation between adsorption isotherm and contact angle

- Wettability alteration in 1-dimensional experiments (cells with blocked lateral surfaces)

- Up-scaling of wettability alteration processes

 - (Wettability alteration using core plugs with different dimensions)

- Wettability alteration during viscous flooding (low differential pressures)

Several thesis problems may be defined in this area.

New types of wettability modifiers

The costs for the most efficient wettability modifiers are rather high, and they are also rather toxic. The project aims to identify wettability modifiers that are cheaper and more environment-friendly than chemicals identified earlier. Candidate chemicals are selected in co-operation with chemical suppliers. Wettability before and after exposure of carbonate rocks to chemicals will be determined. For promising candidates, retention and thermal stability will be determined.

One student can work on this subject.