



Precipitation of sparingly soluble salts in packed sandbeds

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One of the main problems encountered by the oil extraction industry, is the reduction of the local permeability of the rock formation near the extraction wells because of salt deposition in the pores of the rocks during the injection of brine water to displace the trapped oil ganglia within the oil formations. This phenomenon makes the oil recovery less efficient and under extreme cases the well is abandoned with a large amount of oil entrapped.

Several detailed studies have been conducted in the past concerning sand bed consolidation using sparingly soluble salts for varying conditions (e.g. temperature, grain size, sand type, salt concentrations etc) and various salts [1]. Nevertheless, salt precipitation in the rock formation pores under the presence of other miscible or immiscible substances with water has not been investigated in details yet.

In the present study, salt (CaCO_3) precipitation experiments were performed in small beds packed with sea sand mixed with a low amount of CaCO_3 seed grains. The experiments were performed using pure solutions (NaHCO_3 , $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$) and solutions mixed with Ethylene Glycol in sand beds. Additionally, precipitation experiments were performed using pure solutions in sand beds saturated with oil phase (n-dodecane) for a wide range of solution supersaturation. During the experiments the ionic strength was kept constant. pH and concentration values of calcium ion of the effluent were measured and the precipitated salt crystals were identified using X-ray Diffraction (XRD) method. At the end of each experiment Scanning Electron Microscope (SEM) was conducted using a sample of the precipitated sand to identify the morphology of the precipitated crystals and their cohesion with sand grains.

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References

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