Geophysical Research Abstracts
Vol. 21, EGU2019-**PREVIEW**, 2019
EGU General Assembly 2019

Visualization experiments of salt precipitation in homogeneously-wet microchannels

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Multiphase flow processes taking place during Enhanced Oil recovery (EOR), CO_2 or gas storage, geothermal energy production and utilization, membrane filtration processes etc. are usually accompanied by undesirable phenomena of scaling due to the nucleation and growth mechanisms of sparingly soluble salts in pores or on rock surfaces. The evolution of this kind of processes depend on the morphology and structure of the porous medium, the pore surface wettability, the viscosity ratio etc. [1]. Salt precipitation results in the decrease of the local permeability of the porous medium and consequently in operational problems [2]. During past decades, sparingly soluble salt precipitation mechanisms have been investigated in relation with several parameters such as pH, temperature, ionic composition, the presence of additives in the supersaturated fluids, the presence of seeds etc. [3]. Moreover, in the case of calcium carbonate precipitation in porous media, recent experimental results showed that the presence of organic solvents (water miscible and immiscible e.g. oil phase) influence strongly the salt precipitation mechanisms and crystal growth [4,5]. During salt precipitation in porous media, the presence of immiscible oil phase was found to accelerate crystal formation at the interfaces of oil-water [4]. In this work, we study salt precipitation in homogeneously–wet microchannels of Y junction. The effect of pore surface wettability on calcium carbonate precipitation is investigated by performing visualization experiments in hydrophobic and hydrophilic microchannels in the presence of organic water-immiscible phase (n-dodecane).

AKCNOWLEDGEMENTS

We acknowledge support of this work by the Project "WetμFluid" (Code 172) which is implemented under the Action "1st Call for H.F.R.I. Research Projects for the support of Post-doctoral Researchers" funded by Hellenic Foundation for Research and Innovation.

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