Contribution ID: **240** Type: **Poster**

Pore-scale Imaging of Oil Flow Dynamics In a Mixed-wet Carbonate Reservoir Rock at Subsurface Conditions Using Synchrotron Fast Tomography

Tuesday, 18 September 2018 17:15 (15 minutes)

Imaging and characterization of multiphase flow though porous media at the pore-scale is essential to understand the fluid dynamics that control for instance oil recovery and efficiency of carbon dioxide storage in the subsurface formations. Non-destructive dynamic pore-scale imaging using X-rays generated by a synchrotron light source along with an advanced flow apparatus that is almost transparent to X-rays and can withstand high pressures and temperatures have allowed the imaging of fluid dynamics in porous media at subsurface conditions.

In this work, an aged carbonate reservoir rock (mixed-wet) extracted from a very large producing oil field was fully saturated with prepared reservoir formation brine. Then, oil (crude oil mixed with 25 weight percent of diiodomethane used as an X-ray dopant) was injected at constant flow rate (2 μL/min) at subsurface conditions (10 MPa and 60 ℃). The dynamics of oil invasion though the mixed-wet reservoir rock were captured by fast X-ray three-dimensional imaging while measuring the pressure drop across the rock sample using a very sensitive pressure transducer.

Oil percolated through the centre of larger pores with oil-wet surfaces. Whereas, brine was retained in pore corners and interstices that were water-wet. When oil reached the hydrophilic porous plate at the base of the rock sample, the pressure drop started to build up resulting in oil invasion into smaller pores that have higher capillary entry pressure.

Primary author: Mr ALHAMMADI, Amer (Department of Earth Science and Engineering, Imperial College London, London, SW7 2AZ, United Kingdom)

Co-authors: Dr SINGH, Kamaljit (Department of Earth Science and Engineering, Imperial College London, London, SW7 2AZ, United Kingdom); Ms GAO, Ying (Department of Earth Science and Engineering, Imperial College London, London, SW7 2AZ, United Kingdom); Dr LIN, Qingyang (Department of Earth Science and Engineering, Imperial College London, London, SW7 2AZ, United Kingdom); Mr SCANZIANI, Alessio (Department of Earth Science and Engineering, Imperial College London, London, SW7 2AZ, United Kingdom); Prof. BLUNT, Martin (Department of Earth Science and Engineering, Imperial College London, London, SW7 2AZ, United Kingdom); Dr BIJELJIC, Branko (Department of Earth Science and Engineering, Imperial College London, London, SW7 2AZ, United Kingdom)

Presenters: Mr ALHAMMADI, Amer (Department of Earth Science and Engineering, Imperial College London, London, SW7 2AZ, United Kingdom); Ms GAO, Ying (Department of Earth Science and Engineering, Imperial College London, London, SW7 2AZ, United Kingdom)

Session Classification: Poster session 2

Track Classification: P1 Instrumentation and methods