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Contact Angle Measurements of scCO2 and Brine in 3D Printed Models with Varying Surface Roughness

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Geomaterial pore networks are highly tortuous with intricate geometries and varying surface roughness. It is reported in literature that both pore geometry and surface roughness influence flow through porous media (Ketcham and Carlson, 2001; Noiriel et al., 2016; Lv et al., 2017). Surface roughness is quantified by the deviations in the direction of flow perpendicular to the real surface. Simplified pore networks with known geometric shapes and the quantified surface roughness affords the opportunity to back-calculate internal forces and begin to quantify the effect on contact angles. 3D printed models printed using acrylonitrile butadiene styrene were designed with an internal structure of void geometries to represent a flow path with different geometric interfaces. To look at surface roughness, different techniques were used to add surface roughness to the models. The models were exposed to chemicals that reacted with the material surface to add microscopic surface roughness and macroscopic roughness was added via design and printing techniques. Each model was placed in a core flooding setup and exposed to a series of CO2-saturated brine and scCO2 injections to mimic underground conditions. Once at residual conditions, the core-flooding setup was set to shut-in conditions and scanned used X-Ray micro-computed tomography. 3D reconstructions contain information to measure contact angles, analyze forces, and correlate each to the geometries and surface roughness of each model. Analysis of the local impact to scCO2-brine contact angles within pores with varying surface roughness will be presented.

References

1.Ketcham, R. A. and Carlson, W. D. Acquisition, optimization and interpretation of X-ray computed tomographic imagery: applications to the geosciences. Computers & Geosciences, 27 (2001), 381-400.
2.Noiriel, C. Steefel, C. I., Yang, L., and Bernard, D. Effects of pore-scale precipitation on permeability and flow. Advances in Water Resources, 95 (2016), 125-137.
3.Lv, P., Liu, Y., Wang, Z., Lui, S., Jiang, L., Chen, J., and Song, Y. In Situ Local Contact Angle Measurement in a CO2-Brine-Sand System Using Microfocused X-ray CT. American Chemical Society Langmuir, 33 (2017), 3358-3366.

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