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Probing foam's texture in porous media with Neutron scattering and X-ray tomography

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Foam injection is believed to be a promising technique to enhance oil recovery. One of the key characteristics of the foam and its rheology in porous media is its texture which describes the spatial distribution and size of the gas bubbles. Yet, the description of the texture of a foam confined in a real porous medium is a challenging issue because conventional methods do not have adequate spatial and temporal resolution or are not adapted to opaque media. The foam texture has been extensively investigated in 1D and 2D micromodel experiments or from bubble size measurements outside the core. Until now, in-situ measurements of foam's texture during foam flow in porous media has not been experimentally investigated.

Small Angle Neutron Scattering (SANS) is a powerful technique to probe the microstructure of Bulk foams (from the nanometer scale to the micrometer scale). We propose here to extend this technique to characterize the foam in a real 3D granular media by using contrast matching conditions. In this study, SANS acquisitions are made in a specific cell allowing pressure drop measurements and control of flow rate injections. The foam made of Sodium Dodecyl Sulfate (SDS) and Nitrogen is generated in-situ by co-injection of gas and the surfactant solution. The porous media are made of fused silica grains, prepared and sieved according to specific targeted grain distributions. The geometrical characteristics of the pore network are extracted by image analysis from X-ray micro-tomography and compared to the calculated bubble size. Foam texture is measured as a function of foam quality, interstitial velocity and grain size distribution.

In parallel, we run experiments on a Bentheimer core using a CT X-ray scanner in which pressure drop measurements and saturations are measured for different foam qualities and interstitial velocities. We used a methodology to trace back to the in-situ texture. The two experimental approaches are compared in terms of foam generation, flow and in-situ texture.

References

(1) Schramm, Laurier L., Foams: Fundamentals and Applications in the Petroleum Industry; American Chemical Society: Washington, DC, 1994.
(2) Hirasaki, G. J.; Lawson, J. B. Mechanisms of Foam Flow in Porous Media: Apparent Viscosity in Smooth Capillaries. Society of Petroleum Engineers Journal 1985, 25, 176–190.
(3) Axelos, M. A. V.; Boué, F. Foams As Viewed by Small-Angle Neutron Scattering. Langmuir 2003, 19, 6598–6604.

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