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Oil recovery mechanisms in fractured tight carbonates by low-IFT foams

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Fracture systems exists in carbonate oil reservoirs with either natural or artificial origins. The permeability contrast between the fracture and the matrix makes most injection fluids bypass the matrix and result in low matrix oil recovery, especially for low-permeability matrices. Low IFT gas and foam injections can enhance oil recovery by decreasing capillary pressure and diverting gas from the fracture to the matrix. We use micro-coreflood experimentation and in-situ micro CT imaging to study the pore-scale mechanisms of gas-oil-water displacements in the fracture, at the fracture-matrix interface and within the matrix during gas and foam flows. In general, foam recovers additional oil in the matrix compared with gas injection and the matrix oil recovery increases with the decreasing gas-oil IFT. Foam ruptures at the fracture-matrix interface play a critical role for oil displacement in the matrix and are controlled by pore throat sizes and the gas-oil IFT. Last, oil displacement in the matrix by the near-miscible gas/foam flow benefits from the synergy of low-IFT capillary invasion and mass transfer across the gas-oil interface, which caused a uniform saturation profile in the radial direction of the matrix.

Time Block Preference

Time Block C (18:00-21:00 CET)

References

Xiongyu Chen and Kishore K. Mohanty (2021), Pore-Scale Study of Oil Recovery by Gas and Foam in a Fractured Carbonate Rock at Different Gas–Oil Interfacial Tension, Energy & Fuels

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