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Probing the Effect of Oil Type and Saturation on Foam Flow in Porous Media

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The foam efficiency in the oil displacement processes is governed by foam stability which is generally reduced with the presence of oil. In this study, we investigate the effect of oil type and saturation on foam strength in Berea sandstone cores using coreflooding and nuclear magnetic resonance (NMR) imaging. Foam quality scan in the presence of remaining hexadecane showed higher apparent viscosities compared to the oil-free case except at very high foam qualities. We analyzed the foam-induced oil displacements mechanisms from the saturation profiles, measured by NMR, and determined the relative significance between the increased capillary number and the micellar solubilization. Furthermore, we carried out foam-oil co-injection tests with hexadecane, octane, and reservoir crude oil to correlate foam apparent viscosity with the oil saturation. Under our experimental condition, it was determined that with the increase in oil saturation, foam apparent viscosity first decreases because of foam weakening with oil; and then increases due to oil emulsification with the surfactant solution. The observed trend was similar for octane and hexadecane. However, octane resulted in higher foam destabilization and lower emulsification.

References

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