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Morphology and Viscosity of Water-in-Crude Oil Emulsions Formed by Light, Medium, and Heavy Crudes[1] DIANA BERSHADSKY, DIEGO F. MURIEL, JOSEPH KATZ, Johns Hopkins University — Rheology and microscopy are used to examine the effect of oil properties and adding dispersant on the time evolution of the morphology and viscosity of salt water-in-crude oil emulsions. The emulsion viscosity from Platform Henry, a medium viscosity oil (0.06 $Pa\,s$), decreases with increasing shear rates from 10^4 to 15 times that of the crude oil, with water droplet diameters in the 0.4 to 4 μm range. Cold lake and Platform Gina, both heavy crudes (0.27 and 1.3 $Pa\,s$, respectively) also entrain water despite their high viscosity, with droplets in the 0.3 to 7 μm range, and a maximum viscosity increase of 350 and 13 times that of the respective oil. The emulsion viscosity of heavy oils increases with time, presumably due to aggregation. Unlike light oils, where dispersant accelerates phase separation, only 11% of the water is extracted from these emulsions after 21 days. The remaining emulsions are non-Newtonian and have different droplet sizes and spatial distribution. The corresponding mean diameters are larger and their distributions have higher polydispersity. The associated maximum viscosities decrease by 10 times for the medium oil, and by 15-16% for the heavy oils. Hence, dispersants may be used for decanting of light oil emulsions, but not of heavy ones.

[1]MPRI. Multi Partnership Research Initiative, Canada.

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