Experimental Measurements and Modeling of Interfacial Tension for Injected Gas + Live Oil Systems at Elevated Pressures

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Abstract

Interfacial tension is a physical parameter which plays an important role in many processes in a number of industrial applications. In the petroleum industry, near-critical fluids recovery, gas condensate recovery, in particular by gas injection, wetting behavior, secondary and tertiary crude oil recovery, low surface tensions are very important to measure. These surface tensions (i.e. liquid/vapor interfacial tensions) must be accurately known because of their dominating influence on capillary pressures, relative permeabilities and residual liquid saturations. These properties depend heavily on the density of the phases involved.

One objective of this study was to develop an accurate measuring procedure for this system using the pendant drop method based on Iranian oil Reservoir samples and its immiscible injecting gas at reservoir condition. Another objective was to study the behavior of the interfacial tension with pressure and temperature in a range of (14.7-4500 Psia) and (110-200 ^{o}F). Since experimental measurements are often unavailable, expensive and time-consuming, models are regularly used. A new correlation for estimating of IFT was provided using non-linear multivariable regression method. This correlation uses density difference as input value, detailed comparisons show that validity and accuracy of the new correlation are in good agreement with experimental data set of Iranian oil reservoir fluids.

This paper is organized as follows. Section 1 is related to introduction. Section 2 describes the experimental method and apparatus and discusses the obtained results and their accuracy and reproducibility. Section 3 focuses on new correlation and comparing with experimental data. We outline our conclusions in Section 4.

Keyword: interfacial tension, pendant drop, correlation, gas injection, temperature, Iranian crude, pressure.