Contribution ID: **179** Type: **Poster (+) Presentation**

Calculation Studies on Miscibility Characteristics of the CO2/n-Hexadecane System with Presence of Water Component under Geological Conditions

Wednesday, 2 June 2021 16:00 (1 hour)

Accompanying the great achievements owing to the quick development of science and high technology, the greenhouse effect and energy crisis have shown serious negative impact to human society. Aiming at solving the two problems simultaneously, the CO2 Enhanced Oil Recovery (CO2-EOR) technology has attracted wide research interests. Taking CO2 as the injection fluid, this technology can not only improve the oil production, but also store large amount of greenhouse gas in underground formations, thereby to fulfill the resourceful utilization as well as the geological sequestration of the greenhouse gas.

The CO2 flooding process is a typical multi-component multi-phase system consisting mainly of gas, oil and water. Thermodynamic calculations have shown great advantages of low capital and time costs compared to experimental measurements of the complex system. In correspondence to the miscibility measurements in the Pendant Drop Shape Analyzer (KRUSS DSA100HP), calculation studies on the miscibility characteristics of the CO2/oil/water system in the interfacial region of the contacting phases were performed. n-Hexadecane (n-C16H34) is employed as the oil component and water is introduced into the two phase system as the dissolved component in CO2. PR-EOS with modified alpha functions and Binary Interaction Parameters (BIPs) is employed to calculate the Minimum Miscibility Pressure (MMPs) of the CO2/n-C16H34 system with or without water presence at three temperatures of 40.3℃, 55.4 ℃ and 70℃. Calculation model and the employed parameters were validated through comparison with corresponding measurements, including the observation on decreased MMPs of the CO2/H2O/n-C16H34 system in comparison with the CO2/n-C16H34 system. In addition, parameter studies were carried out for the CO2/n-C16H34 system with or without water presence at different molar ratios.

Following conclusions could be obtained:
(1) With taking water saturated CO2-rich phase in the calculation procedure, the MMPs of the CO2/H2O/n-C16H34 system were obtained at three temperatures of 40.3℃, 55.4 ℃ and 70℃. Comparisons between the calculation and measurement results show the maximum AD less than 10 and the AAD of 7.35%, validating the calculation results as well as the calculation model and procedure.
(2) Calculation results reveal the decreased MMPs of the CO2/H2O/n-C16H34 system in comparison with the CO2/n-C16H34 system under the same temperature, which is also comply with the corresponding measurement observations.
(3) Parameter studies were carried out for the CO2/n-C16H34 system with or without water presence at different molar ratios under different temperatures. It is found the existence of water component could unanimously lower the MMPs of the CO2/n-C16H34 system and the degree of the MMP reduction was related to the molar ratio of CO2. It is observed that, the higher the molar ratio of CO2 in the system, the larger MMP deviation between CO2/C16H34 system and CO2/H2O/C16H34 system.
It is expected the research work could make substantial contributions to help the design of CO2 EOR and greenhouse geological storage processes in the field applications.

Time Block Preference

Time Block B (14:00-17:00 CET)

References

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