



Contribution ID: 211

Type: Oral Presentation

Calculation of CO₂-oil minimum miscibility pressure for tight reservoirs considering adsorption effect

Wednesday, 15 May 2024 11:40 (15 minutes)

CO₂ miscible injection holds tremendous potential for enhancing tight oil recovery, where achieving the minimum miscibility pressure (MMP) is crucial. The adsorption of CO₂ and oil in nanopores affects the CO₂-oil MMP in tight reservoirs, necessitating the precise calculations of nanoscale MMP and a comprehensive understanding of influencing factors. In this work, we employed a modified Peng-Robinson equation of state (PR-EOS) for nanoscale MMP calculations, incorporating adsorption layers and effective molar volume to describe molecular adsorption. Additionally, our improved method accounted for capillarity and critical point shift. The accuracy of this approach is validated against molecular simulations and nanofluidic experiments, with a maximum deviation of 4.61%. We observed that in nanopores, achieving miscibility demands less CO₂ than in bulk. The CO₂-oil MMP reduces as pore size decreasing, influenced by adsorption, capillarity and critical point shift. At 5 nm, the MMP is 11.12 MPa, 27.8% lower than the bulk value (15.4 MPa). Adsorption intensifies this reduction by curtailing free molecules and effective pore radius, and becomes more pronounced for lighter hydrocarbon mixtures. However, the nanoscale CO₂-oil MMP is equal to the bulk value when $r_p \geq 350$ nm. Furthermore, a maximum MMP and the corresponding transition temperature exist for each pore size, and increase as pore size increasing. This method provides a valuable tool for optimizing CO₂ miscible injection and carbon storage in challenging nanoscale-pore reservoirs.

Acceptance of the Terms & Conditions

[Click here to agree](#)

Student Awards

Country

China

Porous Media & Biology Focused Abstracts

References

Conference Proceedings

I am interested in having my paper published in the proceedings.

Primary author: WANG, Zengding (China university of petroleum (East China))

Co-authors: DING, Keli (China University of Petroleum (East China)); YAO, Jun (China University of Petroleum (East China)); LIU, Tengyu (China University of Petroleum (East China)); SUN, Hai (China University of Petroleum (East China)); YANG, Yongfei (China University of Petroleum (East China)); ZHANG, Lei (China University of Petroleum (East China)); DELSHAD, Mojdeh (The University of Texas at Austin); SEPEHRNOORI, Kamy (The University of Texas at Austin); ZHONG, Junjie (China University of Petroleum (East China))

Presenter: WANG, Zengding (China university of petroleum (East China))

Session Classification: MS13

Track Classification: (MS13) Fluids in Nanoporous Media