Contribution ID: **416** Type: **Poster Presentation**

Simulation of the Microscopic Three-Phase Flow Process in CO2 Miscible Flooding at the Pore Scale

Monday, 13 May 2024 14:55 (1h 30m)

CO2 flooding after water flooding can effectively improve the recovery efficiency of low-permeability reservoirs. At present, the seepage law of CO2 flooding after water flooding is generally determined through indoor core experiments and macroscopic numerical simulation methods, and simulations of the seepage process at the microscopic pore scale are lacking. Among the existing microscopic numerical simulation methods, two-phase flow simulation is generally the main focus, and multiphase flow simulation under the conditions of three-phase coexistence of oil, gas, and water is lacking. In view of the above problems, this paper conducts a microscopic numerical simulation of the CO2 flooding seepage process after water flooding based on a two-dimensional heterogeneous pore model of circular media and studies the effects of interface tension and injection velocity on the three-phase seepage process, gas breakthrough time, and gas recovery degree during the multistage miscible process. The research shows that when the interfacial tension between CO2 and oil is high, CO2 pushes water and oil forward in a piston-like manner and penetrates the water layer to contact the oil, which ultimately causes the continuous water phase to separate from the gas phase and form the main flow line of the continuous gas phase. With decreasing interfacial tension between CO2 and oil, i.e., closer to the miscible state, the gas diffuses into the water after injection and accumulates at the water-oil interface, the crude oil is displaced toward the production end, and the flow speed of CO2 is faster than that of the water phase. The lower the interfacial tension is, the shorter the gas breakthrough time at the outlet after CO2 injection. Before the miscible state of CO2 and oil, the lower the interfacial tension is, the earlier the gas channeling time, and the lower the recovery degree. After mixing, a turning point occurs. An increase in the injection velocity will advance the gas breakthrough time and gas channeling time at the outlet, leading to an increase in the gas recovery degree. This study has reference and guiding significance for understanding the three-phase flow characteristics of oil, water, and gas during CO2 miscible flooding in mines.

Acceptance of the Terms & Conditions

Click here to agree

Student Awards

Country

China

Porous Media & Biology Focused Abstracts

This abstract is related to Porous Media & Biology

References

Conference Proceedings

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

Primary authors: Mr LI, Jing (China University of Petroleum (East China)); Dr CUI, Chuanzhi (China University of Petroleum (East China))

Presenter: Mr LI, Jing (China University of Petroleum (East China))

Session Classification: Poster

Track Classification: (MS09) Pore-scale modelling