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Study on enhanced WAG expanding swept volume technology based on carbon dioxide thickener

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Abstract: The low viscosity of CO₂ and the non-homogeneity of the reservoir can easily cause early gas channeling in the reservoir, which greatly reduces the sequestration and utilization of CO₂, so it is important to study the technology of CO₂-WAG flood to expand the wave and volume in the onshore non-homogeneous reservoir. Therefore, we synthesized a chemical agent for CO₂ responsive thickening, which is used to expand the wave and volume of CO₂-WAG flood and improve oil recovery. This paper focuses on the fluid and reservoir characteristics of strongly inhomogeneous reservoir in Daqing Aonan. Under the temperature and pressure of the target block, long core driving experiment and two-dimensional non-homogeneous microscopic visualization flooding experiment were carried out, and the effect of CO₂ flooding and wave reach efficiency under different flooding methods were obtained, and the laws of CO₂ flooding and wave reach and the optimal injection scheme under different injection methods in non-homogeneous reservoirs were summarized. The study shows that: ① the enhanced CO₂-WAG flood in non-homogeneous reservoirs can significantly inhibit gas flushing and viscous fingering compared with the ordinary CO₂-WAG flood and CO₂ flood, and form a piston type stable displacement leading edge, which can significantly improve the oil/gas flow rate ratio. ② Enhanced CO₂-WAG flood can improve the recovery rate of more than 8% on the basis of CO₂ flood and water flood, and the foam emulsion formed can significantly increase the pressure difference between injection and extraction, and can block the advantageous channels and cracks of gas flood. ③ The enhanced WAG flood can have good utilization effect on the microscopic residual oil in the small and large orifice throats and blind ends, so the enhanced CO₂-WAG flood has the highest microscopic sweep efficiency and recovery degree under the other three types of drive replacement (chemical flood, CO₂-WAG flood, CO₂ flood).

Keywords: enhanced CO₂-WAG; non-homogeneous reservoir; different injection methods;

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