

Study on the Mechanism of CO₂-Viscoelastic Fluid Synergistic Oil Displacement in Tight Sandstone Reservoirs

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Abstract : Tight oil reservoirs have poor physical properties, insufficient formation energy, and low natural productivity; it is necessary to effectively improve their crude oil recovery. CO₂ flooding is an important technical means to enhance oil recovery and achieve effective CO₂ storage in tight oil reservoirs, but its heterogeneity is strong, which makes CO₂ flooding prone to gas channeling and poor recovery. Aiming at the problem of gas injection channeling, combined with the excellent performance of low interfacial tension viscoelastic fluid (GOBTK), the research on CO₂-low interfacial tension viscoelastic fluid synergistic oil displacement in tight reservoirs was carried out, and the synergy of CO₂ and low interfacial tension viscoelastic fluid was discussed. Oil displacement mechanism. Experiments show that GOBTK has good injectability in tight oil reservoirs (K_g=0.141, 0.793mD); CO₂-0.4% GOBTK synergistic flooding can improve the recovery factor of low permeability layers (31.41%) under heterogeneous (gradient difference of 10) conditions the effect is better than that of CO₂ flooding (0.56%) and 0.4% GOBTK-water flooding (20.99%); CO₂-GOBTK synergistic oil displacement mechanism includes: 1) The formation of CO₂ foam increases the flow resistance of viscoelastic fluid, forcing the displacement fluid to flow 2) GOBTK can emulsify and disperse residual oil into small oil droplets, and smoothly pass through narrow pores to produce; 3) CO₂ dissolved in GOBTK synergistically enhances the water wettability of the core, and the use of viscosity Elastomeric fluid injection and stripping of residual oil; 4) CO₂-GOBTK synergy superimposes multiple mechanisms, effectively improving the swept volume and oil washing efficiency of the injected fluid to the reservoir.

Keywords : tight oil reservoir, CO₂ flooding, low interfacial tension viscoelastic fluid flooding, synergistic oil displacement, EOR mechanism

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