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Application of gel particles in the regulation of oil-water permeability curve

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In chemical oil drive technology, injecting polymers and surfactants is considered an effective method for adjusting the permeability of reservoir rocks, thereby influencing the flow characteristics of oil and water phases. While the effects of polymers and surfactants on the relative permeability of oil and water have been extensively studied, the impact of gel particles on the oil-water phase permeability curve remains under-researched. In this study, we intend to conduct a series of oil-water two-phase flow experiments under laboratory conditions, aiming to explore how different types, particle sizes, and concentrations of gel particles affect the phase permeability curves. Through these experiments, we aim to achieve an in-depth understanding of how the physicochemical properties of gel particles specifically influence the oil-water two-phase flow characteristics. We anticipate that the concentration and particle size of the gel particles will be key factors in determining the shape and location of the phase penetration curves. Additionally, numerical simulations will be utilized to model the reservoir-scale flow characteristics of gel particles and their potential impact on the oil-water phase infiltration curves, aiming to attain a more comprehensive understanding of how gel particles can enhance oil-water phase infiltration performance. The findings of this study hold significant importance in optimizing oilfield displacement. By rationally selecting the type, concentration, and particle size of gel particles, an effective enhancement in oilfield recovery is expected, thereby offering new perspectives for oilfield development.

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