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# Study on Foam Flow Behavior in Fractured-Vuggy Systems

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For deep fractured-vuggy carbonate reservoirs, foam flooding is an effective oil recovery method. However, the connectivity and anisotropy of the fractured-vuggy network affect the plugging performance of foam and the ability to adjust the displacement profile. Therefore, it is necessary to conduct a comprehensive investigation on the migration characteristics of foam, in order to provide guidance for the oilfield application of foam flooding.

The fractured-vuggy system exhibits heterogeneity and strong diversion capabilities. When developing a model that can represent reservoirs with fractured-vuggy formations, it is challenging to simultaneously satisfy the characteristics of multiple experiments with a single model. The flow behavior of foam in fractured-vuggy system is a crucial factor that needs to be observed, so it is necessary to appropriately relax the requirements for simulating reservoir temperature and pressure conditions. Based on the combination relationships of fractures, wall effects, and fluid properties, a multi-dimensional and multi-scale fractured-vuggy model was developed. This model, combined with the selected foam system, was used to study the evolution of foam structure, flow characteristics, gas-liquid distribution patterns, and oil displacement properties within the fractured-vuggy model. The study summarized the dynamic and static matching relationships between fractured-vuggy dimensions and foam, investigated the improvement effects of foam on shielding fractured-vuggy flow, and comprehensively analyzed the changes in the foam displacement front and the different distribution characteristics of gas and liquid in fractures under the influence of various factors. The study clarified the foam displacement characteristics corresponding to different production scenarios.

The experimental results show that, due to limitations in the channel dimensions, there are differences in the quantity and shape of foam distribution within fractured-vuggy formations after injection. Significant variations also exist in the evolution patterns during the static stable stage of foam. The shielding effect of foam displacement between fractures is dynamically adjusted. This is because high-quality stable foam gradually "plugs" dominant fractures, increasing the flow resistance for subsequent foam in the dominant fractures. Consequently, some foam is still able to divert towards the inferior fractures.

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## References

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