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Simulation Study of Asphaltene Deposition and Solubility of CO2 in the Brine during Cyclic CO2 Injection Process in Unconventional Tight Reservoirs

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Abstract : A compositional reservoir simulation model (CMG-GEM) was used for cyclic CO₂ injection process in unconventional tight reservoir. Cyclic CO₂ injection is an enhanced oil recovery process consisting of injection, shut-in, and production. The study of cyclic CO₂ injection and hydrocarbon recovery in ultra-low permeability reservoirs is mainly a function of rock, fluid, and operational parameters. CMG-GEM was used to study several design parameters of cyclic CO₂ injection process to distinguish the parameters with maximum effect on the oil recovery and to comprehend the behavior of cyclic CO₂ injection in tight reservoir. On the other hand, permeability reduction induced by asphaltene precipitation is one of the major issues in the oil industry due to its plugging onto the porous media which reduces the oil productivity. In addition to asphaltene deposition, solubility of CO₂ in the aquifer is one of the safest and permanent trapping techniques when considering CO₂ storage mechanisms in geological formations. However, the effects of the above uncertain parameters on the process of CO₂ enhanced oil recovery have not been understood systematically. Hence, it is absolutely necessary to study the most significant parameters which dominate the process. The main objective of this study is to improve techniques for designing cyclic CO₂ injection process while considering the effects of asphaltene deposition and solubility of CO₂ in the brine in order to prevent asphaltene precipitation, minimize CO₂ emission, optimize cyclic CO₂ injection, and maximize oil production.

Keywords : tight reservoirs, cyclic O_2 injection, asphaltene, solubility, reservoir simulation
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