

格子ボルツマン法による地震波の水油 2 相流体に及ぼす

影響の検討

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Lattice Boltzmann Simulation of Seismic Stimulation for Mobilization of a Water-oil Two-phase Flow

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Abstract

It has been observed that seismic stimulation of oil reservoirs has an impact on oil production, and we can apply seismic stimulation for enhanced oil recovery (EOR). Recently, many laboratory experiments and field tests have been conducted. Seismic stimulation can contribute to the coalescence/dispersion of oil droplets, and make them move through the pore-throat; however, the detailed mechanism of seismic stimulation is not fully understood. We focus on the behavior of oil droplet flow at the pore-throat, and we analyze trap and flow mechanisms at the pore-throat under the influence of seismic waves. We model the pore-throat in reservoir rocks, and adopt the lattice Boltzmann method (LBM) for oil droplet flow simulation. LBM is a well-known computational simulation method in fluid dynamics and is preferred to analyze microscopic flow phenomena. Using LBM, we can simulate an oil and water two-phase flow under complex boundary conditions including wettability of a solid surface. From our research, we conclude that the phenomenon of oil flow forced by seismic stimulation at the pore-throat depends on various factors, for instance, capillary pressure induced by interfacial tension between two-phase fluids.

Key words : lattice Boltzmann method, seismic wave, enhanced oil recovery, seismic stimulation
EOR, capillary pressure

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