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Title(English)	Study on Suppression of Viscous Fingering In Three Dimensional Porous Media by Using X-Ray Microtomography
著者(和文)	MahardikaMohammad Azis
Author(English)	Mohammad Azis Mahardika
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Thesis Outline

This study focuses on the mechanism of suppressing viscous fingering by different methods. Investigation of viscous fingering suppression was performed by visualizing the interface using micro-CT. By using micro-CT, the interface of phases in porous media can be captured. Three methods to suppress viscous fingering are investigated.

First, interplay between viscous and gravitational force was investigated in vertical displacement porous media. Viscous and gravitational forces determine the interface stability regarding stabilising or destabilising the interface. It was found that critical velocity determines the boundary between stable or unstable interfaces. Fingering patterns were differentiated from mixing length. This method only works for vertical well, where gravitational force has the same direction as the fluid movement. In the next chapter, another method to suppress viscous fingering in a horizontal direction is addressed.

Second, the effect of chemical reaction with increasing viscosity on the performance of polymer flooding was investigated. An increase in viscosity improves the oil recovery compared with no chemical reaction. Visualization showed the polymer is pushed more because the chemical reaction impedes the viscous fingering. This method successfully increases oil recovery by suppressing viscous fingering. However, polymer flooding was unsuitable for high-viscosity oil due to the high pressure required, which can fracture the reservoir. To solve this problem, a new method was created.

Third, alkali flooding producing viscoelastic material for high viscous oil recovery, was investigated. The chemical reaction between alkali and oil acid produces viscoelastic material. Viscous fingering is successfully suppressed, and oil recovery is enhanced compared with water flooding. In addition, this method also works in the heterogenous layer porous media. The mechanism of this method was investigated from visualization from X-ray CT and micromodel.