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Countercurrent imbibition into tight porous media: Theory and methodology

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For investigating the recovery mechanism of countercurrent imbibition in the process of hydraulic fracturing and shut in well in cyclic water injection, experiment system of countercurrent imbibition in tight oil reservoir and experiment method of flow resistance measurement caused by reverse displacement was established by high-pressure physical simulation system for large scale outcrops. Two different permeability models were employed in the physical simulation of countercurrent imbibition, and their flow law were studied. The results show that under the experimental conditions, the effect of countercurrent imbibition is very bad, and the lower of the permeability, the worse the effect of countercurrent imbibition. Water enters the matrix through the capillary force to replace the oil, and forms an oil-water mixing zone in the zone of the fracture which hinder fluid flow. The countercurrent imbibition swept distance of the 2mD and 0.2mD outcrop model was 10cm and 8cm, in this area, recovery percent of the 2mD and 0.2mD outcrop model was 6.3% and 3.7%.

References

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