Contribution ID: **688** Type: **Poster (+) Presentation**

Imbibition Effect and Driving Mechanism of Nanofluid in Porous media

Wednesday, 2 June 2021 10:00 (1 hour)

The imbibition mechanism is the basis for efficient development of unconventional dense reservoirs, and it is the key to clarify the imbibition mechanism to find out the driving forces of oil imbibition in porous media. Based on MRI and static permeation test, the In-situ changing images of oil in different cores from ultralow permeability to high permeability were obtained for 200h days. These in-situ diagrams can well explain the driving force of the imbibition of crude oil in different permeability cores.

The test results show that the oil distribution map of high and medium permeability core is stronger from bottom to top, the oil drainage of low permeability and ultra low permeability core is slow, the oil recovery is low, and there is no obvious difference between upper and lower oil distribution images, but gradually fade from peripheral to inner.

Theoretical studies show that oil droplets are mainly affected by differentiation force (i.e. buoyancy and gravity difference), capillary force (i.e. deformation capillary resistance and pore wall viscous capillary resistance), while the main driving force of oil drainage in different permeability cores of nanofluids is different. The capillary resistance in high and medium permeable rock is small, the differentiation force is the dominant driving force, and the oil droplet is subjected to upward movement from bottom to top. The capillary resistance of the porous core is large, and the differentiation force is difficult to push the oil the oil droplet out. The imbibition mainly depends on the spontaneous equilibrium of the three-phase interface and internal diffusion to produce droplet exchange, which gradually weakens from inside to outside.

Therefore, the theoretical analysis is consistent with the NMR. Nanofluids can enhance core hydrophilicity and reduce oil-water interfacial tension, and accelerate the spontaneous balance of three-phase interface and reduce capillary force, which is beneficial to stripping oil droplets from core wall. Therefore, nanofluids can improve the efficiency of oil drainage, whether for high permeability cores or ultra-low permeability cores.

Time Block Preference

Time Block A (09:00-12:00 CET)

References

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