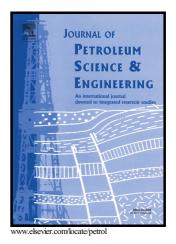
## Author's Accepted Manuscript

Nanoparticles Influence on Wetting Behaviour of Fractured Limestone Formation

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#### Nanoparticles Influence on Wetting Behaviour of Fractured Limestone Formation

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#### ABSTRACT

Nanoparticles have gained considerable interest in recent times for oil recovery purposes owing to significant capabilities in wettability alteration of reservoir tocks. Wettability is a key factor controlling displacement efficiency and ultimate recovery of oil. The present study investigates the influence of zirconium (IV) oxide ( $ZrO_2$ ) and nickel (II) oxide (NiO) nanoparticles on the wetting preference of fractured (oil-wet) limestone formations. Wettability was assessed through SEM, AFM and contact angle. The potentials of the nanoparticles to alter oil-wet calcite substrates water wet, was experimentally tested at low nanoparticle concentrations (0.004-0.05 wt. %). Quite similar behaviour was observed for both nanoparticles at the same particle concentration; while  $ZrO_2$  demonstrated a better efficiency by altering strongly oil-wet (water contact angle  $\theta = 152^{\circ}$ ) calcite substrates into a strongly water-wet ( $\theta = 44^{\circ}$ ) state, NiO changed wettability to an intermediate-wet condition ( $\theta = 86^{\circ}$ ) at 0.05 wt. % nanoparticle concentration. We conclude that  $ZrO_2$  is very efficient in terms of inducing strong water-wettability; and  $ZrO_2$  based nanofluids have a high potential as EOR agents.

### Keywords

Nanoparticles, Wettability, Zirconium oxide, Nickel oxide.

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