

Adding surface-active materials such as nanoparticles is an ~~One of the newborn~~ emerging methods to ~~of create creating~~ wettability alteration ~~is adding certain surface active materials, including nanoparticles.~~ Nanotechnology ~~has the potential to~~ can introduce revolutionary changes in several areas of ~~the~~ oil and gas industry, ~~for example such as the~~ exploration, production, enhanced oil recovery, and refining (Shah, 2009). Nanoparticles ~~are defined as~~ are surface-active agents, ~~because they have~~ with a very small particle size, which helps them penetrate into the pore volume of porous media, stick on the core surface, and, ~~by creating homogeneous water-wet area,~~ increase surface energy more than the surface tension of water ~~by creating homogeneous water-wet area.~~ ~~Thus~~ With this scheme, the wettability is altered to water-wet and oil is ~~pulled out~~ extracted from the core surface. ~~Recently, only a~~ Only a few studies have been ~~carried out~~ conducted recently, ~~whereas~~ and still a lot of ~~several~~ questions on the influence of nanoparticles on ~~spontaneous imbibition~~ Si, wettability alteration, and ~~the~~ possible improvement of oil recovery ~~have been remained~~ remain unanswered. Clark et al. (1990) ~~found that when an aqueous metal was added into the process, the heavy oil viscosity was further reduced.~~ Cacciola et al. (1993) ~~reported~~ described that nanoparticles ~~to demonstrate~~ have a benign activity, selectivity, and stability for the dehydrogenation of cyclohexane and methylcyclohexane. Ali et al. (2004) and Temple et al. (2005) ~~was investigated~~ investigated the effect of nanoparticles on lowering the permeability of shale in drilling fields ~~and~~ found that ~~Nanoparticles~~ nanoparticles succeeded in blocking water inversion and decreasing the strength of ~~the~~ shale wall. Zhang (2010) ~~asserted that no straining of nanoparticles occurs~~ When as nanoparticles ~~they are~~ passed through porous media, ~~there is no straining of nanoparticles~~ (Zhang, 2010), ~~whereas~~ Yu et al. (2010) ~~found~~ claimed that the nanoparticles ~~are~~ should be roughly ~~two orders of magnitude smaller to be able to pass through the porous media.~~ Fan et al. (2009) ~~studied~~ performed ~~experimentally~~ experiments using ionic liquids to upgrade heavy oil ~~and~~. They found that ~~ionic~~ the liquids could decrease the viscosity, average molecular weight, and asphaltene content of the heavy oil. ~~Similarly,~~ Chen et al. (2009) studied the viscosity reduction of nanoparticles in the catalytic aquathermolysis of heavy oil. Clark et al. (1990) ~~revealed further reduction in the heavy oil viscosity when an aqueous metal was added into the process.~~ Yu et al. (2010) ~~found~~ nanoparticles are roughly ~~2 orders of magnitude smaller to be able to pass through porous media.~~

Comment [A1]: *Newborn* is an informal word to describe the noun *method*; there are better formal alternatives, i.e., *emerging*.

Comment [A2]: Introductory clauses are normally preceded by a *comma*.

Comment [A3]: Note that the use of *have been* implies a present perfect progressive tense, whereas the use of *remained* implies a simple past tense. The use of both these tense together is incorrect.

Comment [A4]: Reconstructed to maintain consistency in the writing style, for example, *Zhang (2010)* and *Cacciola et al. (1993)* are introduced at the beginning of the sentence.

Comment [A5]: This sentence (due its content similarity with the preceding sentence) has been moved here to improve flow and transition.

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