

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 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). By definition, Nanoparticles nanoparticles are defined as are surface-active agents, ~~because as~~ they have 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. ~~Thus~~ With this scheme, the wettability is altered to water-wet and oil is pulled out 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 SI, wettability alteration, and the possible improvement of oil recovery ~~have been remained~~ remain unanswered. Clark et al. (1990) ~~found~~ revealed further reduction in the heavy oil viscosity that when an aqueous metal was added into the process, ~~the heavy oil viscosity was further reduced~~. Cacciola et al. (1993) ~~reported~~ described that the 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). 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 aqua-thermolysis of heavy oil. Yu et al. (2010) ~~found~~ claimed that the nanoparticles ~~are~~ should be roughly 2-two orders of magnitude smaller to be able to pass through the porous media.

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

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

**Comment [A3]:** Reconstructed to maintain consistency in the writing style, i.e., *Zhang (2010)*, *Cacciola et al. (1993)*, etc. are introduced at the beginning of the sentence.

SAMPLE