Contribution ID: **816** Type: **Poster (+) Presentation**

Nanofluid Evaluation for Enhanced Oil Recovery

Wednesday, 2 June 2021 16:00 (1 hour)

Title: Nanofluid Evaluation for Enhanced Oil Recovery
Nanotechnology has the potential to upgrade the oil and gas industry within different areas such as exploration, drilling, production, and enhanced oil recovery (EOR). For instance, the use of nanoparticles as an EOR method exhibit many advantages since: 1)The size and shape of nanoparticles can be easily modified during fabrication. 2) Nanoparticles' surface chemical properties can be easily adapted to turn them hydrophobic or hydrophilic and modify the chemical interaction with specific types of surfaces. 3) Nanoparticles may resist harder conditions in comparison with conventional EOR chemical methods.
During the last decade, numerous studies have been conducted employing nanoparticles for EOR purposes. Different types of nanoparticles, organic and inorganic, show a significant increase in the recovery of crude oil. These results are encouraging, specifically for mature fields.

In Mexico's case, most of the light and medium crude oil fields are mature and waterflooding for pressure maintenance and have shown promising results at increasing oil recovery. The available infrastructure for waterflooding could be used for nanofluid injection pilot tests; however, it is necessary to generate more data regarding rock properties, multiphasic flow behavior, and the interaction among the porous media and the fluids. Also, it is essential to count with experimental data about the efficiency and dynamics of oil recovery acquired by injecting the nanofluid as the "displacing fluid."

Our team recently synthesized LIRF-1 nanoparticle to form Pickering emulsions and study; 1) the effect on the interfacial tension of oil/water mix (mineral and vegetable oils), 2) the displacement of oil in capillary tubes, and 3) the wettability alteration in sandstones by simple imbibition tests.

This work presents the evaluation of LIRF-1 in the formation of Pickering emulsions (O/W) using mineral (ρ=0.920 g/cm3 and ρ=0.84 g/cm3) and Mexican crude (28 °API) oils at different ratios (water to oil), salinity, and nanoparticle concentrations. Also, we carried out oil displacement and core flooding tests, using Berea sandstone to evaluate the interactions between rock-nanoparticles and fluids. Preliminary results showed that nanoparticles displaced up to 50 % of the oil compared to 26 % of oil displaced by brines. Finally, we performed different experiments to measure the contact angle variations and estimate the porous media's wettability alteration by the LIRF-1 nanofluids.

The authors thank funding from PAPIIT IA105621 and CONACYT 280816.

Time Block Preference

Time Block C (18:00-21:00 CET)

References

• Hendraningrat, L.,Engeset,B.,Suwarno,S.,Torsæter,O.,2012.Improved Oil Recovery by Nanofluids Flooding:AnExperimentalStudy.PaperSPE MS Presented at SPE Kuwait International Petroleum Conference and Exhibition, Kuwait City,Kuwait,10–12 December.
• L. Hendraningrat, O. Torsæter, A study of water chemistry extends the benefits of using silica-based Nanoparticles on enhanced oil recovery, Appl.Nanoscience. 6 (2015) 83–95.

• Iskandar F, Dwinanto E, Abdullah M, Khairurrijal, Muraza O. Viscosity reduction of heavy oil using nanocatalyst in aquathermolysis reaction. KONA Powder Part J. 2016;2016(33):3-16.

• Agista MN, Guo K. applied sciences A State-of-the-Art Review of Nanoparticles Application in Petroleum with a Focus on Enhanced Oil Recovery. Appl Sci. 2018:29.

• Magaña Trejo D, Romero García A. Desarrollo y Evaluación de Nanofluidos con Aplicación Potencial en Recuperación Mejorada. 2018.

Acceptance of Terms and Conditions

Click here to agree

Newsletter

Student Poster Award

Yes, I would like to enter this submission into the student poster award

Primary authors: Mr ARGUIJO MUÑIZ, DAVID ANTONIO (UNAM); Dr GÓMORA FIGUEROA, Ana Paulina (UNAM)

Presenter: Mr ARGUIJO MUÑIZ, DAVID ANTONIO (UNAM)

Session Classification: Poster +

Track Classification: (MS16) Fluid Interactions with Thin Porous Media